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2001 • VOLUME 19

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Committee of Provincial Geologists
Chairperson's Report 2001

Le comité des géologues provinciaux (CGP) regroupe les responsables des activités géoscientifiques réalisées par les provinces et territoires canadiens. Les organisations représentées sont les principaux pourvoyeurs de données géoscientifiques à l'industrie minérale. Le comité permet d'échanger de l'information sur les sujets d'intérêt commun. Par ailleurs, le comité entretient des relations étroites avec sa contrepartie fédérale, la Commission géologique du Canada, à travers le comité national des commissions géologiques (CNCG). Ces échanges permettent d'assurer la complémentarité des interventions et des retombées maximales pour les bénéficiaires.

Le CGP a tenu deux réunions régulières au cours de l'année 2001. La première s'est tenue à Toronto en marge de la réunion du Prospectors and Developers Association of Canada. La seconde s'est tenue en septembre à Québec dans le cadre de la Conférence des ministres des Mines et de l'Énergie. Il faut ajouter que chacune des réunions du CGP fut immédiatement suivie d'une réunion avec les partenaires fédéraux (CNCG).

Au cours de l'année, les principaux sujets de discussion furent les suivants:

L'Initiative géoscientifique ciblée

Le gouvernement fédéral a annoncé, en mars 2000, l'allocation d'une somme de 15 M$ répartie sur trois années pour le maintien de l'infrastructure géoscientifique canadienne. Comme ce programme s'appuie sur un partenariat entre les provinces/territoires et le gouvernement fédéral, les membres du CGP ont encore une fois été interpellés en 2001, notamment pour l'élaboration et le classement des projets.

L'Accord géoscientifique intergouvernemental

Le comité national des commissions géologiques (CNCG) a accepté de prolonger d'une année encore les mécanismes de coopération et les principes inclus dans l'Accord géoscientifique intergouvernemental. Rappelons que l'entente initiale prévue pour une durée de cinq ans a été initiée en 1996 et devait se terminer en septembre 2001.

La Stratégie nationale sur les eaux souterraines

Le CNCG, par l'entremise d'une lettre signée par les deux présidents représentant le CGP et la partie fédérale, a signifié au comité ad hoc sur les eaux souterraines son désir d'être associé à la démarche exploratoire initiée par la Commission géologique du Canada (CGC).

L'avenir du Programme national de cartographie géoscientifique du Canada (CARTNAT)

Cette question a été discutée avec le gouvernement fédéral dans le cadre d'une réunion du CNCG. Les partenaires ont convenu de favoriser dans le cadre des programmes existants la mise en œuvre de projets multidisciplinaires de type CARTNAT.

Les stratégies coopératives de cartographie géoscientifique au Canada

En septembre 2000, les ministres des Mines des gouvernements fédéral, provinciaux et territoriaux ont approuvé le document Stratégies coopératives de cartographie géoscientifique au Canada rédigé par le CNCG. Les membres du CGP ont continué, au cours des quatre dernières années, de promouvoir les stratégies coopératives dans leur territoire respectif et auprès du gouvernement fédéral.

Le Réseau canadien de connaissances en sciences de la Terre (RCSST)

Le CGP contribue activement au projet de Reconnaissance de connaissances en sciences de la Terre. Le fait marquant de la dernière année est l'obtention d'une subvention de 290 k$ de GéoConnexions, un organisme du gouvernement fédéral. Le principal projet en cours est celui du Catalogue en ligne de données géoscientifiques dont l'échéance est janvier 2002.

La médaille des géologues provinciaux

Le 10 septembre 2001, lors de la Conférence des ministres des Mines et de l'Énergie, la médaille des géologues provinciaux fut remise à M. Mark Fedikow qui œuvre à l'intérieur de la Commission géologique du Manitoba.

Il nous faut encore une fois cette année remercier la Colombie-Britannique et plus particulièrement Ron Smyth et Brian Grant pour l'excellent travail accompli par l'équipe.

Alain Simard
Président 2001

Committee of Provincial Geologists Chairperson's Report 2001

The Committee of Provincial Geologists (CPG) brings together representatives from each provincial and territorial agency conducting geoscientific activities in Canada. Represented organizations are the main suppliers of geoscience data for the mineral and petroleum industries. The committee offers an opportunity to exchange information on topics of common interest. Moreover, the committee maintains close ties with its federal counterpart, the Geological Survey of Canada, through the National Geological Surveys Committee (NGSC). These exchanges help ensure the complementary nature of projects, and maximum benefits for all stakeholders.

The CPG held two regular meetings during the year 2001. The first took place in Toronto, in conjunction with the annual convention of the Prospectors and Developers Association of Canada. The second was held in September in Québec City, in conjunction with the Mines and Energy Ministers Conference. Both CPG meetings were immediately followed by a meeting with federal partners (NGSC).

Throughout the year, the main topics of discussion were as follows:

The Targeted Geoscience Initiative

The federal government announced in March 2000, the allocation of $15 million over three years to maintain Canada's geoscience infrastructure. Since this program is based on a partnership involving the provinces/territories and the federal government, members of the CPG were called on once again in 2001, namely to develop and assess project proposals.

The Intergovernmental Geoscience Accord

The National Geological Surveys Committee (NGSC) agreed to extend for an additional year the principles and mechanisms for cooperation outlined in the Intergovernmental Geoscience Accord. The initial agreement, originally covering a five-year period, was signed in 1996, and was scheduled to end in September 2001.

The National Groundwater Strategy

The NGSC, through a letter signed by the two co-chairmen representing the CPG and its federal counterpart, expressed to the *ad hoc* national committee on groundwater its desire to be involved in this exploratory process launched by the Geological Survey of Canada (GSC).

The future of the Canadian National Mapping Program (NATMAP)

This issue was discussed with the federal government during a meeting of the NGSC. The partners agreed to favour, within the framework of existing programs, the implementation of NATMAP-type multi-disciplinary projects.

Cooperative Geological Mapping Strategies across Canada

In September 2000, the federal, provincial and territorial ministers of Mines endorsed the document entitled "*Cooperative Geological Mapping Strategies* across Canada" prepared by the NGSC. CPG members have been promoting, over the past four years, cooperative strategies in their respective jurisdictions and with the federal government.

The Canadian Geoscience Knowledge Network (CGKN)

The CPG is an active contributor to the Canadian Geoscience Knowledge Network. The highlight of the past year is a $290 000 grant awarded by GeoConnections, a federal agency. The principal project currently underway is the Canadian Geoscience Data Catalogue, scheduled for release in January 2002.

103-07069/

The Provincial Geologists Medal

On September 10, 2001, during the Mines and Energy Ministers Conference, the Provincial Geologists Medal was awarded to Mr. Mark Fedikow of the Manitoba Geological Survey.

The Provincial Geologists Journal

We must once again thank the British Columbia Survey, and in particular, Ron Smyth and Brian Grant for the excellent work they and their team have accomplished in assembling the document.

Alain Simard
2001 Chairman

MARK FEDIKOW

The Provincial Geologists Medal is awarded to recognize major contributions in the area of geoscientific research and related developments or applications that serve to meet the mandate of Canada's provincial and territorial geological surveys. Each Survey may nominate a candidate each year, and an external national selection committee representing industry, academia and the GSC chooses the recipient from the pool of nominees. For 2001, the winner of the Provincial Geologists Medal was Mark Fedikow of the Manitoba Geological Survey, a division of the Department of Industry, Trade and Mines. The citation below was read by Jean-Louis Caty, sous-ministre associé aux Mines, ministère des Ressources naturelles, during the presentation at the 58th annual Energy and Mines Ministers Conference in Québec City, September 10, 2001. Mark was unfortunately not able to attend the presentation in Québec City in person, so the medal was formally awarded to him at the Manitoba Mines and Minerals Convention in Winnipeg on November 16, by Hon. MaryAnn Mihychuk, Minister of Industry, Trade and Mines.

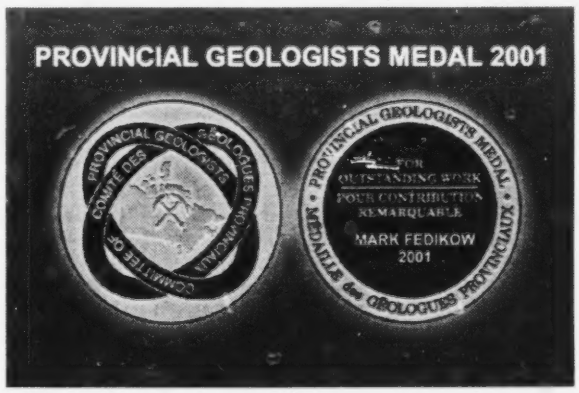
Dr. Mark Fedikow, recipient of the Provincial Geologists Medal from the Honourable Hon. MaryAnn Mihychuk, Minister of Industry, Trade and Mines, Manitoba. The citation, included here, was read by Jean-Louis Caty, sous-ministre associé aux Mines, ministère des Ressources naturelles, during the presentation at the 58 annual Energy and Mines Ministers Conference in Québec City.

Citation

Dr. Mark Fedikow has worked as an exploration geochemist and mineral deposits geologist for the Manitoba Geological Survey for 20 years. Mark is an internationally recognized leader in the development and application of multi-media lithogeochemical surveys in support of mineral exploration in both Precambrian and Phanerozoic terrains in Manitoba. His diverse research background includes pioneering studies of rock alteration and multi-media geochemistry in support of gold and base metal exploration and the statistical analysis of regional, multi-media geochemical data sets.

Most recently, he and his colleagues in the Manitoba Geological Survey have expended a tremendous effort towards the completion of a detailed, multi-media geochemical and diamond indicator mineral survey in the under-explored and remote parts of the northwestern Superior Province in Manitoba. This project encapsulates Mark's dedication to leading, rather than following, the exploration of the Province's mineral endowment. This effort has resulted in a major diamond staking rush in northeast Manitoba, as well as enhanced gold and base metal exploration in the region.

Mark's work is always based on extensive and solid field investigation. He has developed techniques proven to be effective in Manitoba's



Obverse and reverse images of the 2001 Provincial Geologists Medal.

diverse terranes, providing the exploration industry with new tools in the search for unexplored mineral deposits. Although primarily a geochemist, Mark also has a solid mapping background that has proven essential in placing geochemical anomalies in a geological contest.

Mark has demonstrated a keen insight into the processes that concentrate metals in the crust. His scientific curiosity has made him instrumental in the discovery of many new mineral occurrences, including mineral deposit types new to Manitoba. For example, Mark designed and oversaw collaborative studies with the Geological Survey of Canada, the University of Manitoba and Birch Mountain Resources Ltd. on the recently discovered Prairie-type microdisseminated mineralization hosted by Paleozoic carbonates.

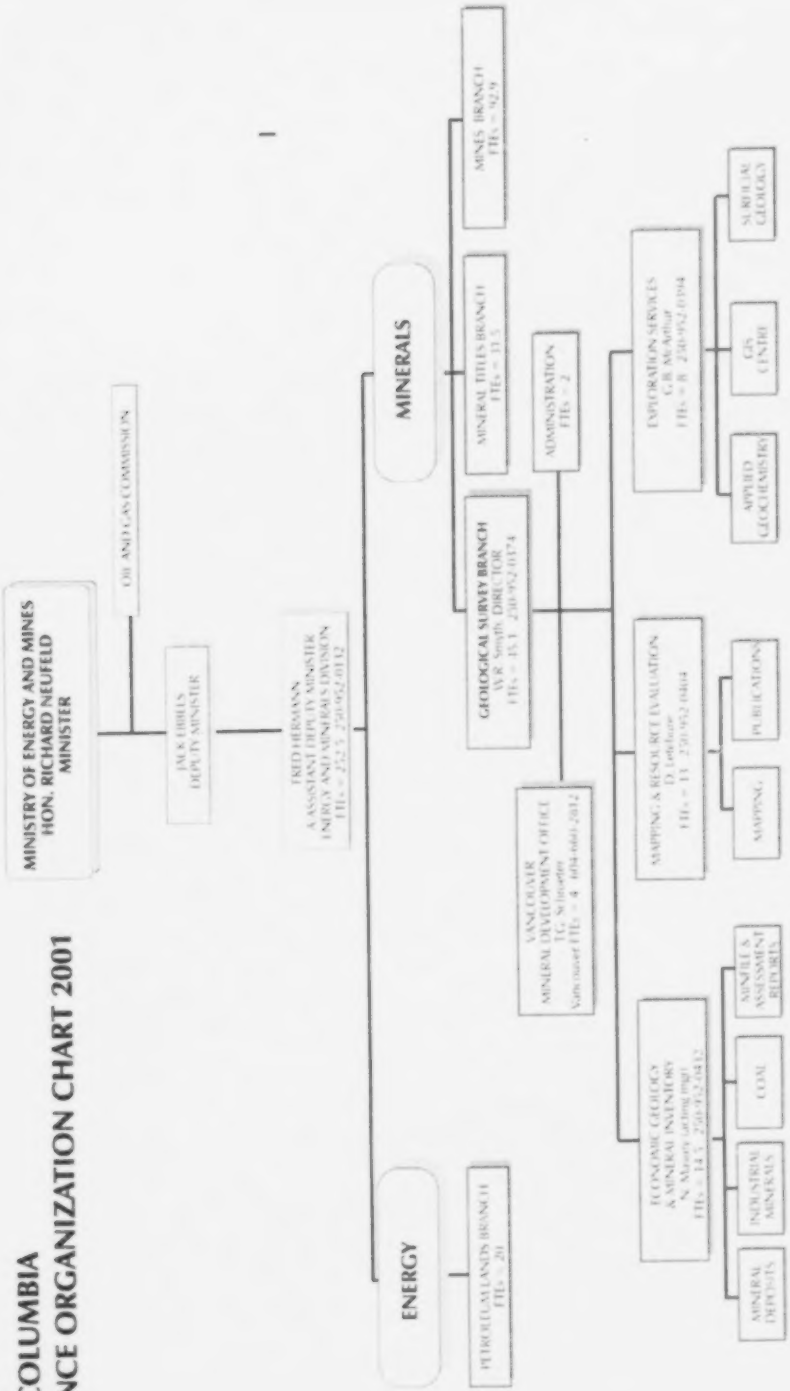
This nomination recognizes Mark's prolific publication record, characterized by innovative and timely reports that have found wide acceptance in both the mineral exploration industry and the research community. Of the more then 150 publications he has completed, 11 are in refereed journals and special volumes and a further 41 are technical reports. The 75 presentations he lists include numerous PDAC, CIMM and GAC/MAC events as well as several visits to International Geochemical Symposiums.

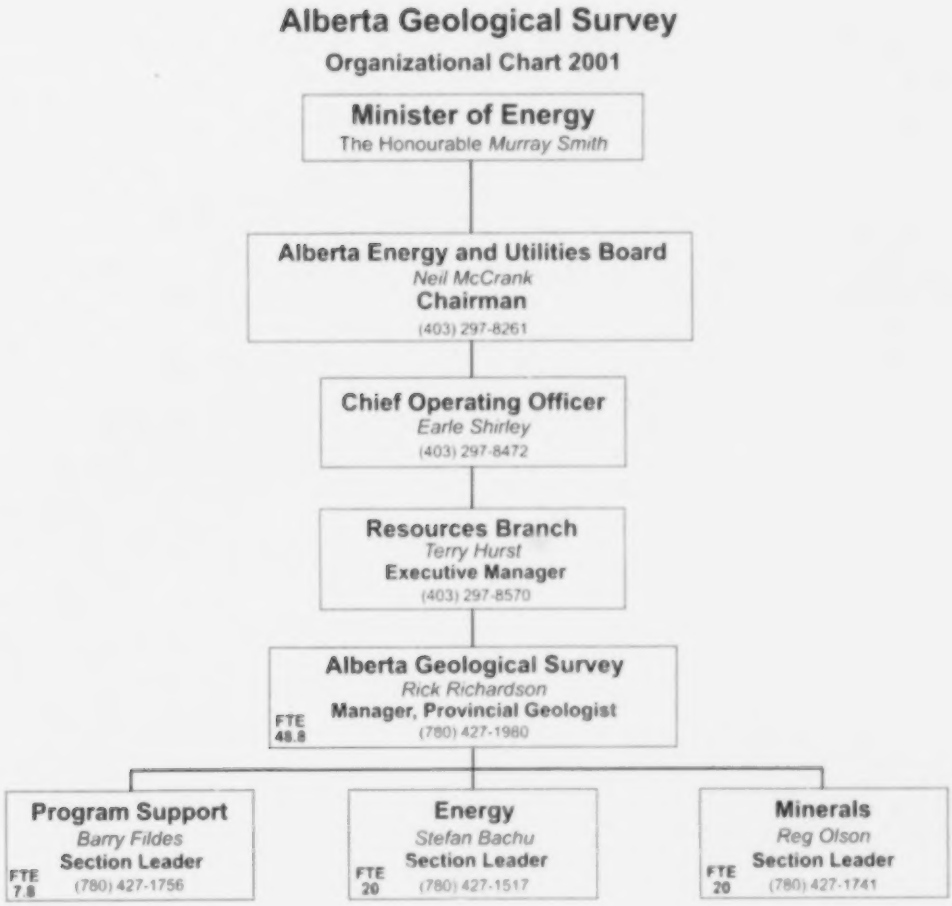
One of Mark's greatest assets is his ability to communicate his knowledge and ideas to a wide range of people. Mark maintains a relentless enthusiasm for new mineral discoveries. This, more than any other factor has allowed him to become the principal contact within the Manitoba Geological Survey for the exploration community. Mark is an effective and recognized teacher, and has done an admirable job in communicating his comprehensive knowledge of a wide range of mineral deposit types and exploration techniques through short courses and field trips. He is a patient teacher to many student geological assistants and has acted as a supervisor to undergraduate and graduate university theses.

Mark Fedikow exemplifies the expertise and enthusiasm that exists within provincial geological surveys across the country and is truly a worthy recipient of the 2001 Provincial Geologists Medal.

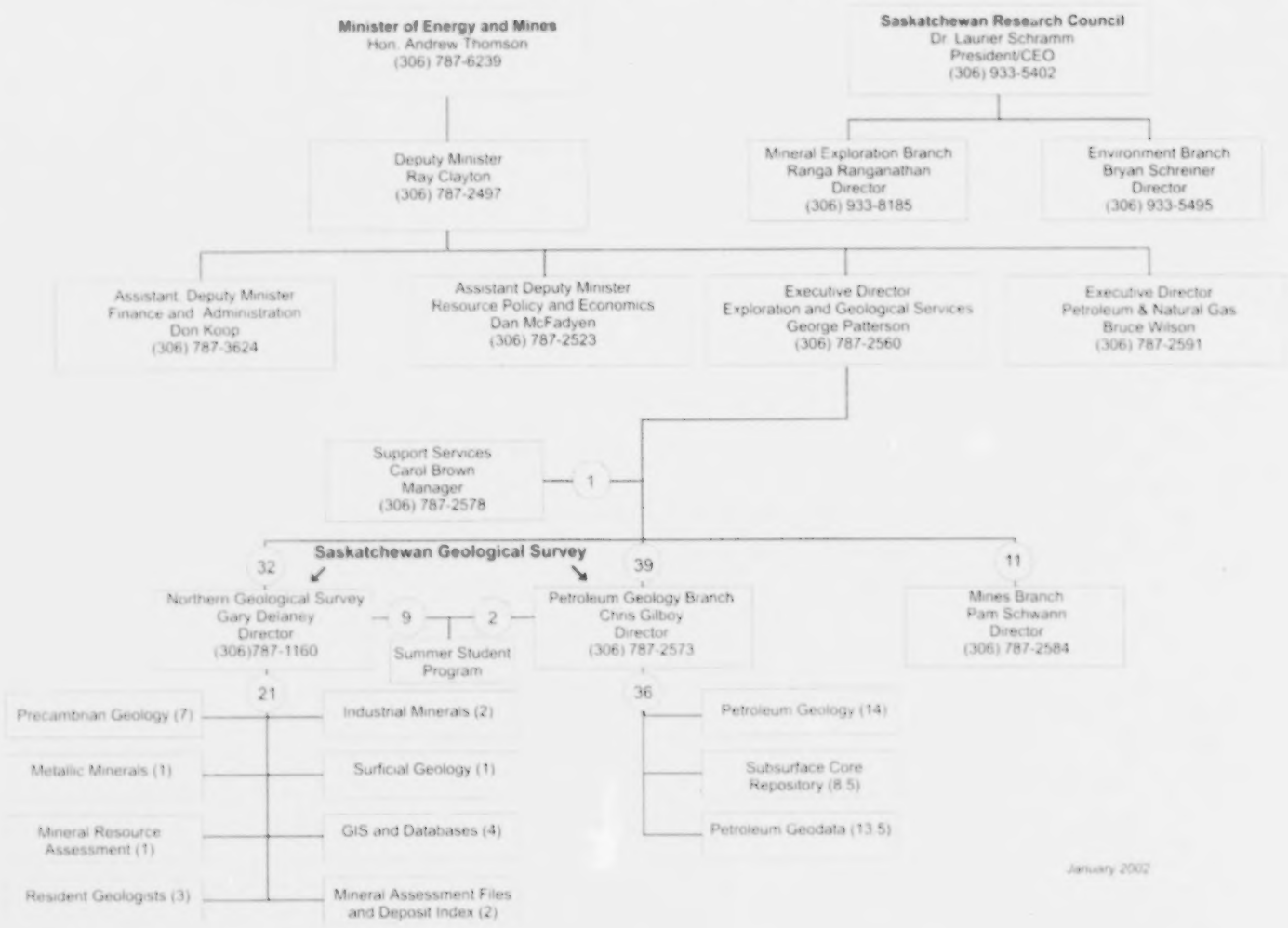
GEOSCIENCE ORGANIZATION CHARTS - 2001

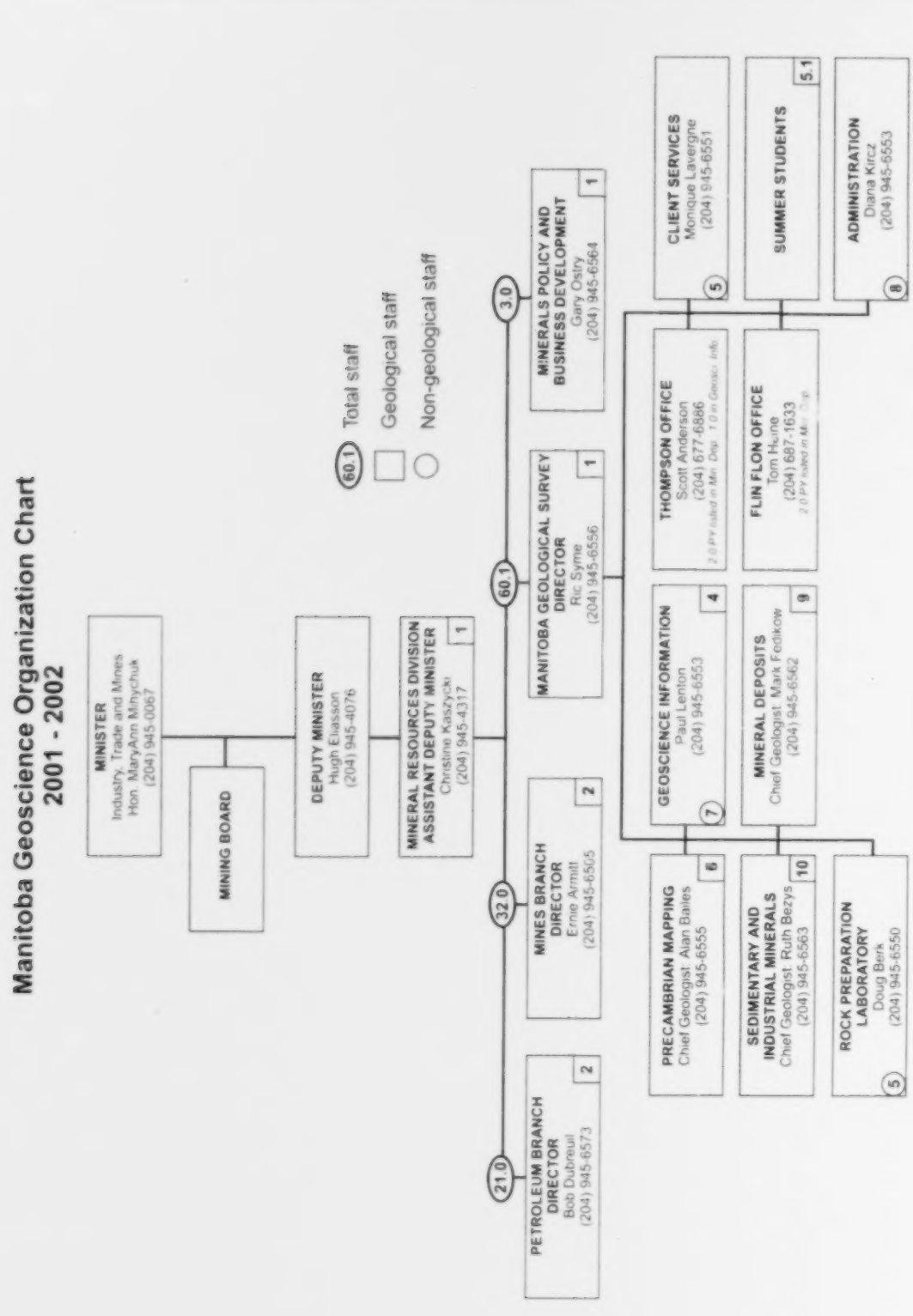
Each Provincial and Territorial government in Canada has developed its own organization structure for conducting geoscientific survey and research work. Some provinces have what is formally called a 'Geological Survey', but in most jurisdictions the main elements of the geological survey function are embraced in one or more Branches or Divisions of provincial Mines/Energy/Natural Resources departments. The following organization charts are set out to help clarify access to geoscience services for potential clients. The charts contain reference to the lines of reporting for the various units in each hierarchy, the staffing associated with each separate jurisdiction, and the names and telephone numbers of key individuals in each system.


BRITISH COLUMBIA
GEOSCIENCE ORGANIZATION CHART 2001
MINISTRY OF ENERGY AND MINES
HON. RICHARD NEUFELD
MINISTER
OIL AND GAS COMMISSION
JAE EBBELS
DEPUTY MINISTER
FRED HEROMAN
ASSISTANT DEPUTY MINISTER
ENERGY AND MINERALS DIVISION
ENERGY
MINERALS
PETROLEUM LANDS BRANCH
GEOLOGICAL SURVEY BRANCH
MINERAL TITLES BRANCH
MINES BRANCH
ADMINISTRATION
VANCOUVER
MINERAL DEVELOPMENT OFFICE
ECONOMIC GEOLOGY & MINERAL INVENTORY
MAPPING & RESOURCE EVALUATION
EXPLORATION SERVICES
MINERAL DEPOSITS
INDUSTRIAL MINERALS
COAL
MINERAL ASSESSMENT REPORTS
MAPPING
PUBLICATIONS
APPLIED GEOCHEMISTRY
GIS CENTRE
SURFICIAL GEOLOGY


Alberta Geological Survey
Organizational Chart 2001
Minister of Energy
The Honourable Murray Smith
Alberta Energy and Utilities Board
Neil McCrank
Chairman
(403) 297-8261
Chief Operating Officer
Earle Shirley
(403) 297-8472
Resources Branch
Terry Hurst
Executive Manager
(403) 297-8570
Alberta Geological Survey
Rick Richardson
Manager, Provincial Geologist
FTE 48.8
(780) 427-1980
Program Support
Barry Fildes
Section Leader
FTE 7.8
(780) 427-1756
Energy
Stefan Bachu
Section Leader
FTE 20
(780) 427-1517
Minerals
Reg Olson
Section Leader
FTE 20
(780) 427-1741

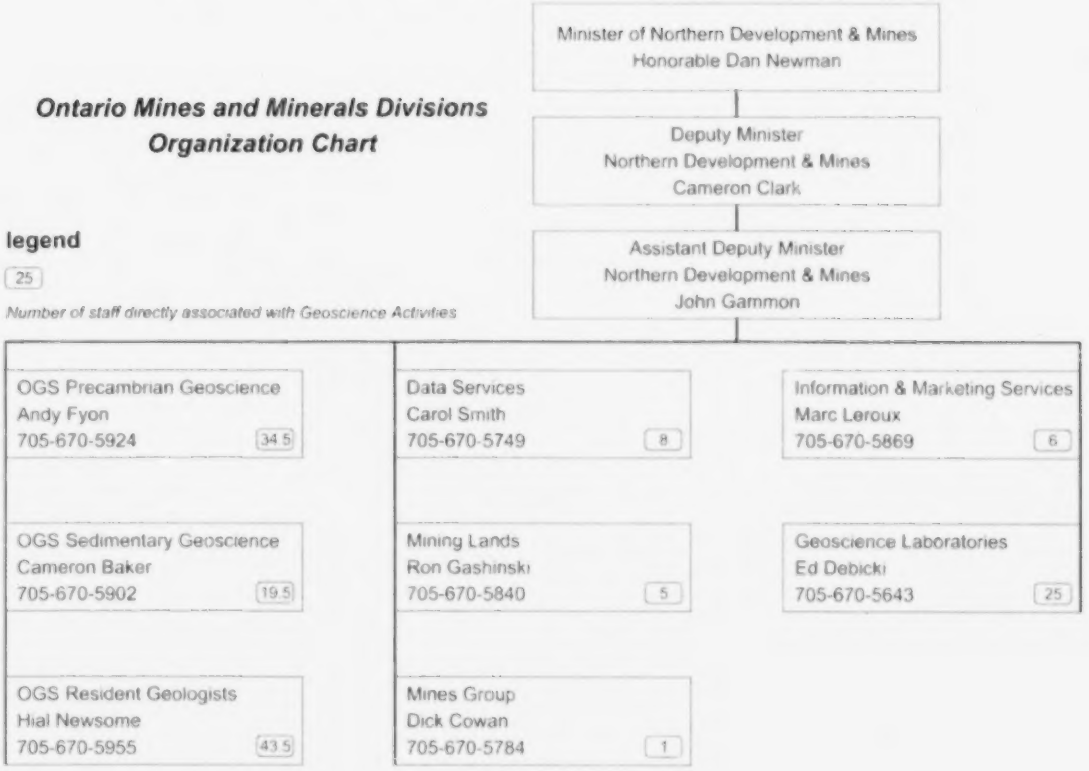
Saskatchewan Geoscience Organization Chart



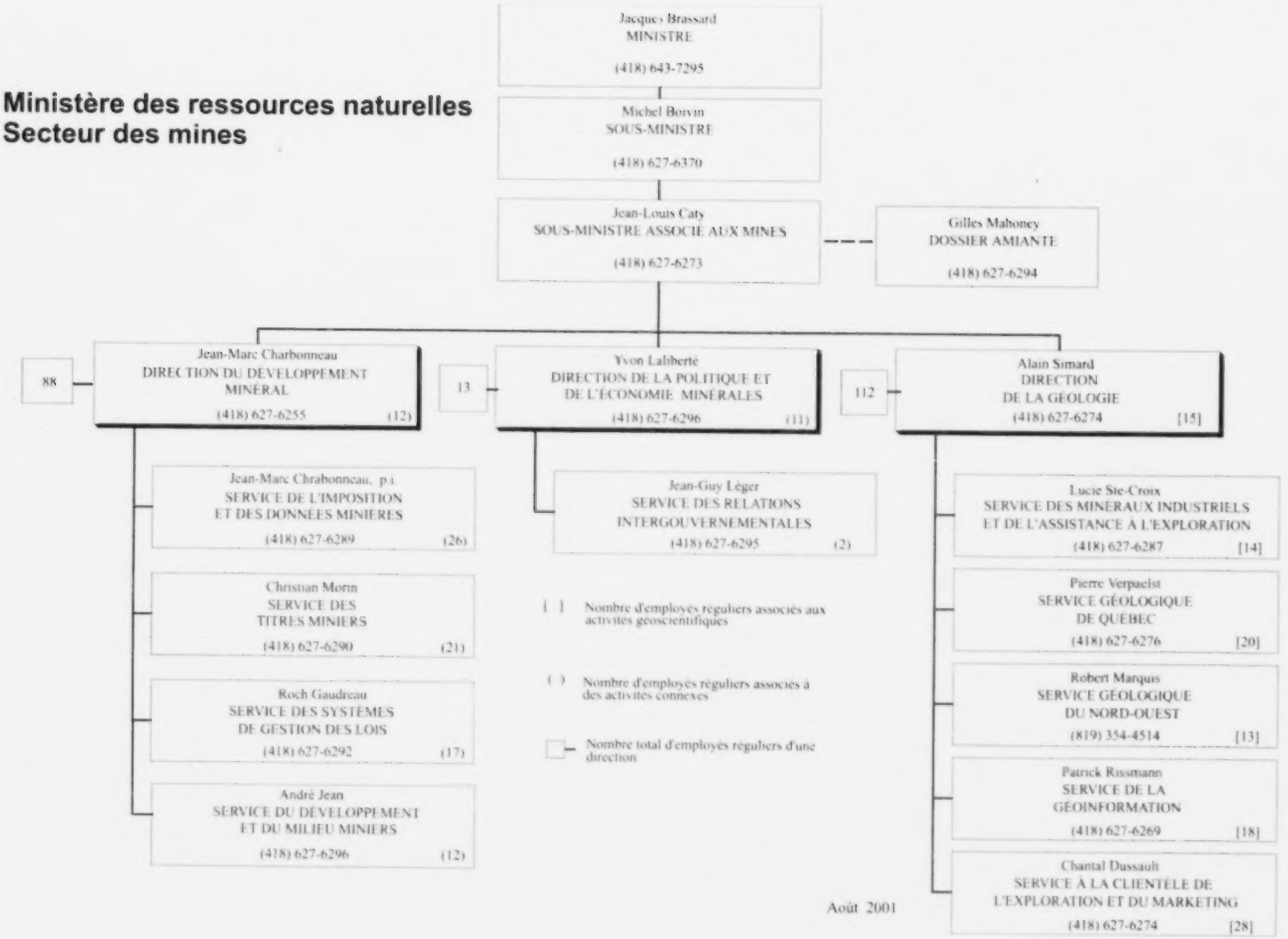

Manitoba Geoscience Organization Chart
2001 - 2002
MINISTER
Industry, Trade and Mines
Hon. MaryAnn Mihychuk
(204) 945-0067
MINING BOARD
DEPUTY MINISTER
Hugh Eliasson
(204) 945-4076
MINERAL RESOURCES DIVISION
ASSISTANT DEPUTY MINISTER
Christine Kaszycki
(204) 945-4317
1
60.1 Total staff
Geological staff
Non-geological staff
21.0
32.0
60.1
3.0
PETROLEUM BRANCH
DIRECTOR
Bob Dubreuil
(204) 945-6573
2
MINES BRANCH
DIRECTOR
Ernie Armitt
(204) 945-6505
2
MANITOBA GEOLOGICAL SURVEY
DIRECTOR
Ric Syme
(204) 945-6556
1
MINERALS POLICY AND
BUSINESS DEVELOPMENT
Gary Ostry
(204) 945-6564
1
PRECAMBRIAN MAPPING
Chief Geologist Alan Bailes
(204) 945-6555
6
SEDIMENTARY AND
INDUSTRIAL MINERALS
Chief Geologist Ruth Bezys
(204) 945-6563
10
ROCK PREPARATION
LABORATORY
Doug Berk
(204) 945-6550
5
GEOSCIENCE INFORMATION
Paul Lenton
(204) 945-6553
7
4
MINERAL DEPOSITS
Chief Geologist Mark Fedikow
(204) 945-6562
9
THOMPSON OFFICE
Scott Anderson
(204) 677-6886
2.0 PY listed in Min. Dep. 1.0 in Geosci. Info.
FLIN FLON OFFICE
Tom Heine
(204) 687-1633
2.0 PY listed in Min. Dep.
CLIENT SERVICES
Monique Lavergne
(204) 945-6551
5
SUMMER STUDENTS
5.1
ADMINISTRATION
Diana Kircz
(204) 945-6553
8

Ontario Geoscience Organization Chart 2001

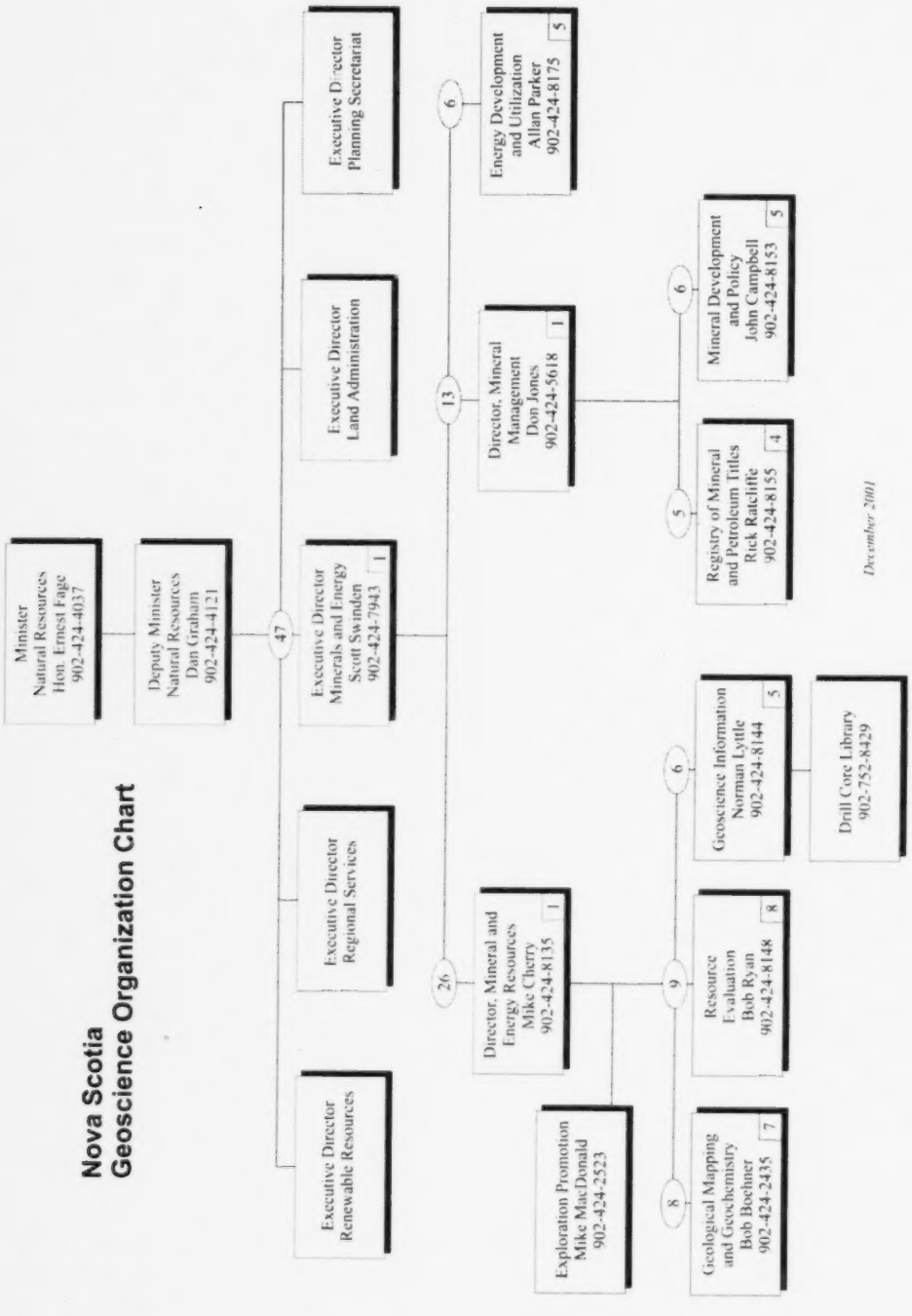
Ontario Mines and Minerals Divisions Organization Chart

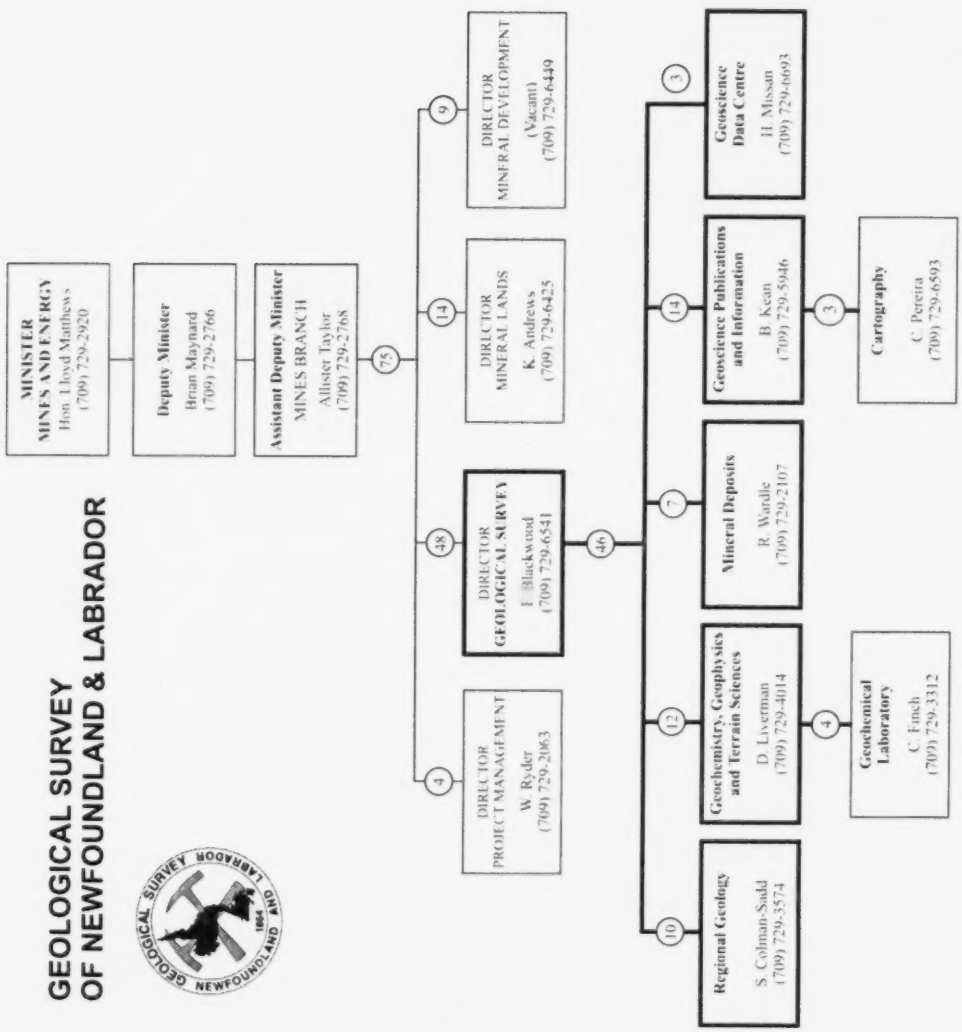


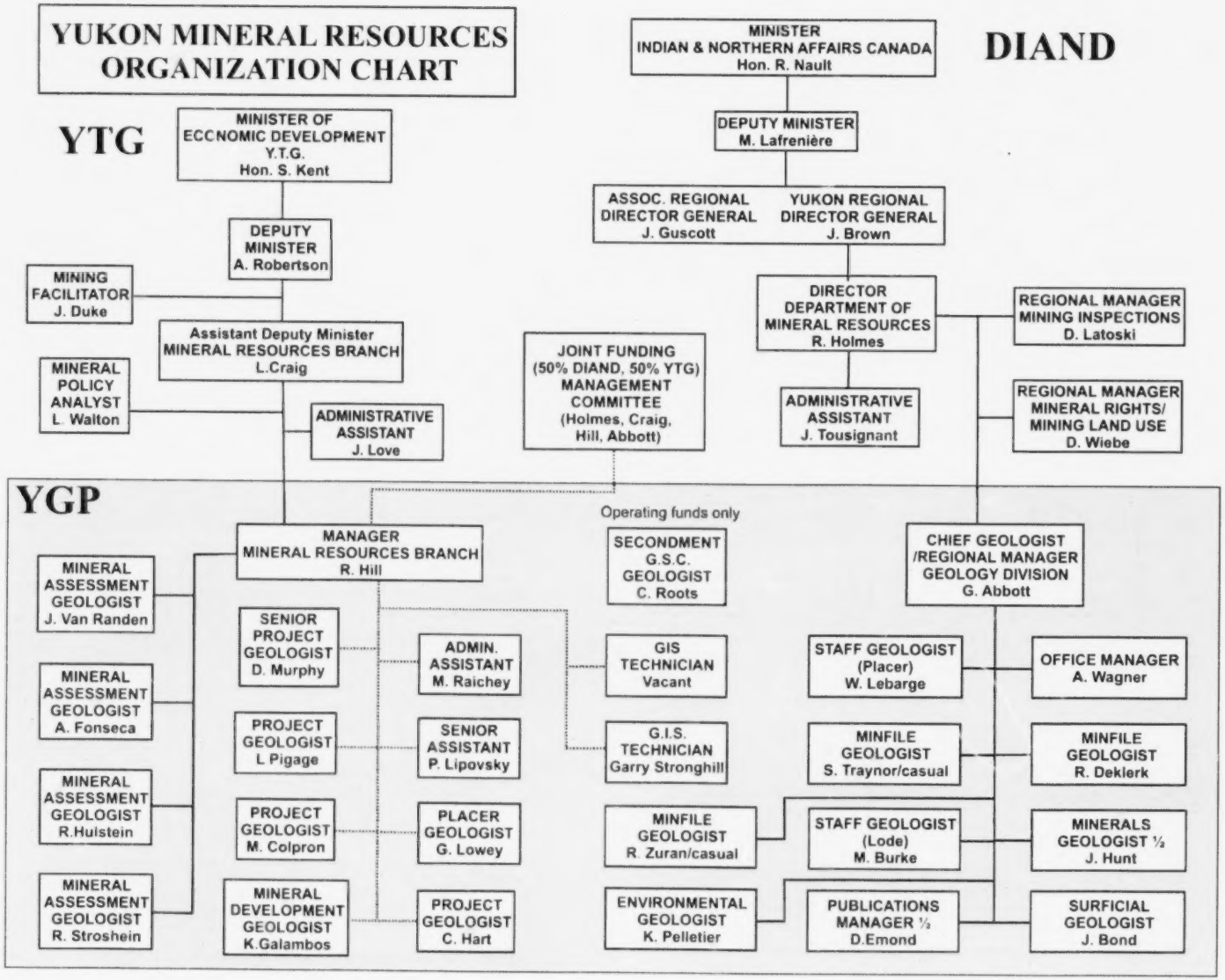
Ministère des ressources naturelles
Secteur des mines



New Brunswick Geoscience Organization Chart 2001

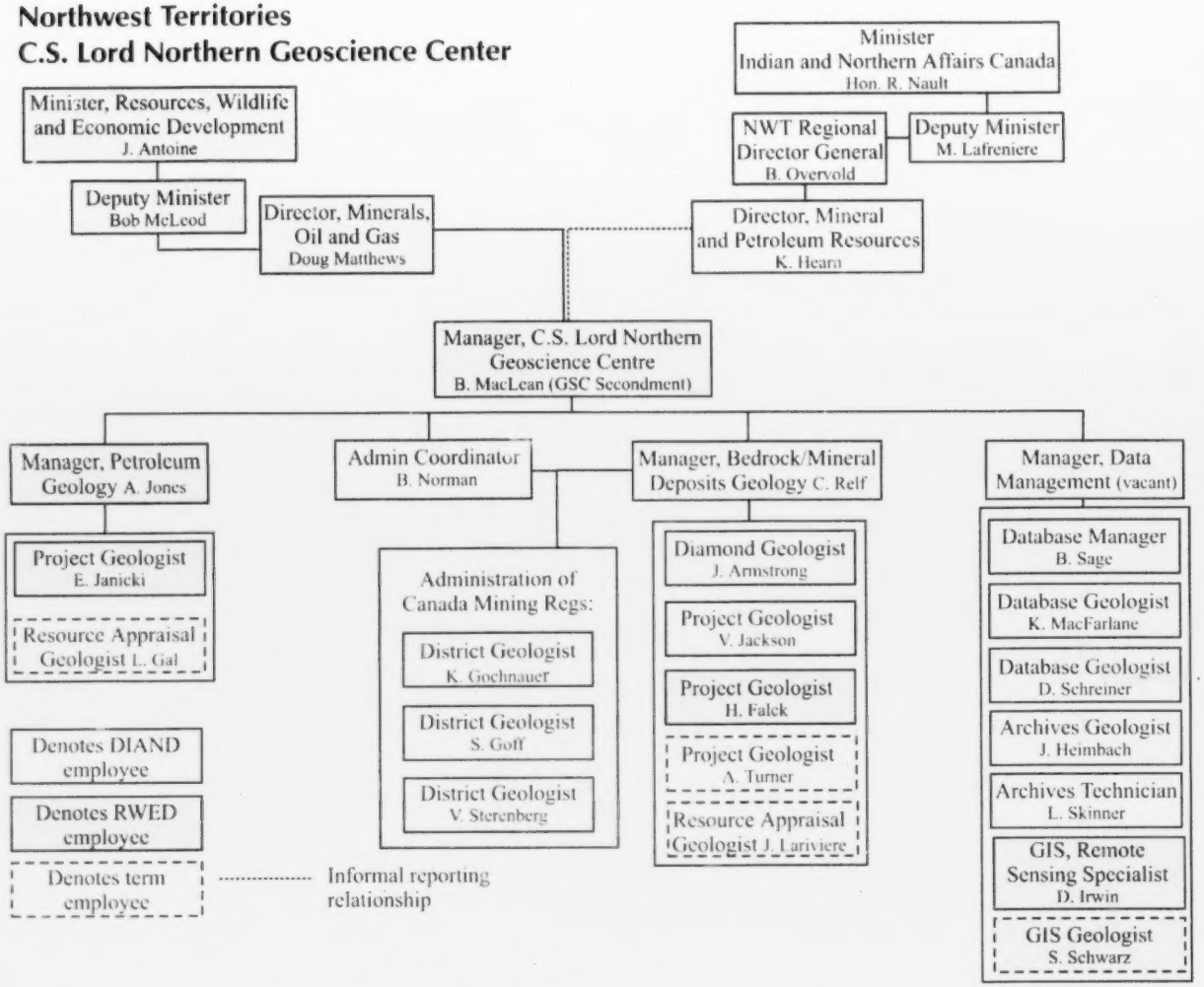

Nova Scotia
Geoscience Organization Chart
Minister
Natural Resources
Hon. Ernest Fage
902-424-4037
Deputy Minister
Natural Resources
Dan Graham
902-424-4121
47
Executive Director
Renewable Resources
Executive Director
Regional Services
Executive Director
Minerals and Energy
Scott Swinden
902-424-7943
1
Executive Director
Land Administration
Executive Director
Planning Secretariat
26
13
6
Director, Mineral and
Energy Resources
Mike Cherry
902-424-8135
1
Director, Mineral
Management
Don Jones
902-424-5618
1
Energy Development
and Utilization
Allan Parker
902-424-8175
5
Exploration Promotion
Mike MacDonald
902-424-2523
9
6
6
Resource
Evaluation
Bob Ryan
902-424-8148
8
Geoscience Information
Norman Lyttle
902-424-8144
5
Mineral Development
and Policy
John Campbell
902-424-8153
5
8
5
Geological Mapping
and Geochemistry
Bob Boehner
902-424-2435
7
Drill Core Library
902-752-8429
Registry of Mineral
and Petroleum Titles
Rick Ratcliffe
902-424-8155
4
December 2001


GEOLOGICAL SURVEY
OF NEWFOUNDLAND & LABRADOR
GEOLOGICAL SURVEY LABRADOR 1964 AND NEWFOUNDLAND
MINISTER
MINES AND ENERGY
Hon. Lloyd Matthews
(709) 729-2920
Deputy Minister
Brian Maynard
(709) 729-2766
Assistant Deputy Minister
MINES BRANCH
Allister Taylor
(709) 729-2768
75
4
DIRECTOR
PROJECT MANAGEMENT
W. Ryder
(709) 729-2063
48
DIRECTOR
GEOLOGICAL SURVEY
F. Blackwood
(709) 729-6541
46
14
DIRECTOR
MINERAL LANDS
K. Andrews
(709) 729-6425
9
DIRECTOR
MINERAL DEVELOPMENT
(Vacant)
(709) 729-6449
10
Regional Geology
S. Colman-Sadd
(709) 729-3574
12
Geochemistry, Geophysics
and Terrain Sciences
D. Liverman
(709) 729-4014
4
Geochemical
Laboratory
C. Finch
(709) 729-3312
7
Mineral Deposits
R. Wardle
(709) 729-2107
14
Geoscience Publications
and Information
B. Kean
(709) 729-5946
3
Cartography
C. Pereira
(709) 729-6593
3
Geoscience
Data Centre
H. Missan
(709) 729-6693

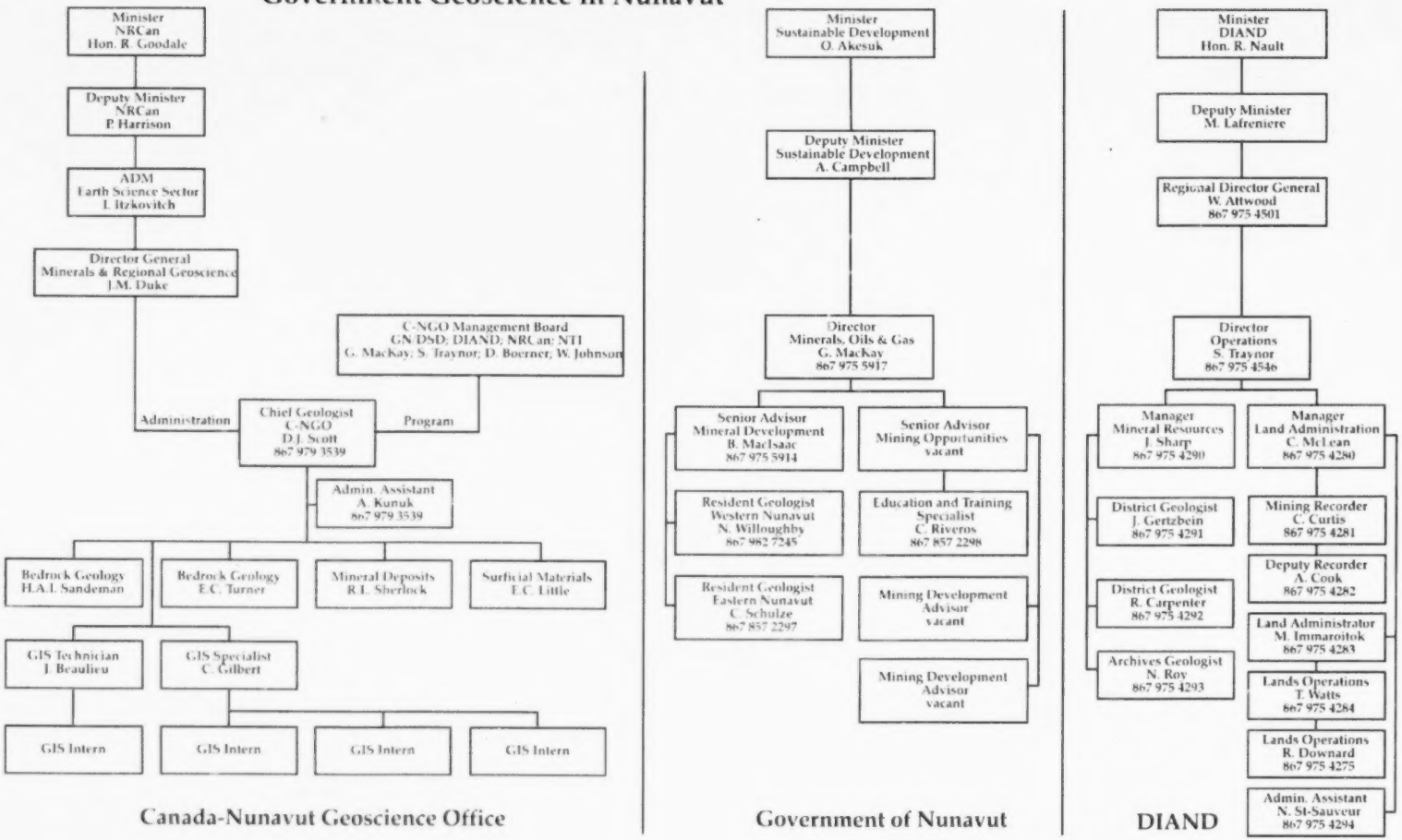

YUKON MINERAL RESOURCES ORGANIZATION CHART
YTG
MINISTER OF ECONOMIC DEVELOPMENT Y.T.G. Hon. S. Kent
DEPUTY MINISTER A. Robertson
MINING FACILITATOR J. Duke
Assistant Deputy Minister MINERAL RESOURCES BRANCH L.Craig
MINERAL POLICY ANALYST L. Walton
ADMINISTRATIVE ASSISTANT J. Love
DIAND
MINISTER INDIAN & NORTHERN AFFAIRS CANADA Hon. R. Nault
DEPUTY MINISTER M. Lafrenière
ASSOC. REGIONAL DIRECTOR GENERAL J. Guscott
YUKON REGIONAL DIRECTOR GENERAL J. Brown
DIRECTOR DEPARTMENT OF MINERAL RESOURCES R. Holmes
ADMINISTRATIVE ASSISTANT J. Tousignant
REGIONAL MANAGER MINING INSPECTIONS D. Latoski
REGIONAL MANAGER MINERAL RIGHTS/ MINING LAND USE D. Wiebe
JOINT FUNDING (50% DIAND, 50% YTG) MANAGEMENT COMMITTEE (Holmes, Craig, Hill, Abbott)
YGP
Operating funds only
MANAGER MINERAL RESOURCES BRANCH R. Hill
SECONDMENT G.S.C. GEOLOGIST C. Roots
CHIEF GEOLOGIST /REGIONAL MANAGER GEOLOGY DIVISION G. Abbott
MINERAL ASSESSMENT GEOLOGIST J. Van Randen
MINERAL ASSESSMENT GEOLOGIST A. Fonseca
MINERAL ASSESSMENT GEOLOGIST R.Hulstein
MINERAL ASSESSMENT GEOLOGIST R. Stroshein
SENIOR PROJECT GEOLOGIST D. Murphy
PROJECT GEOLOGIST L Pigage
PROJECT GEOLOGIST M. Colpron
MINERAL DEVELOPMENT GEOLOGIST K.Galambos
ADMIN. ASSISTANT M. Raichey
SENIOR ASSISTANT P. Lipovsky
PLACER GEOLOGIST G. Lowey
PROJECT GEOLOGIST C. Hart
GIS TECHNICIAN Vacant
G.I.S. TECHNICIAN Garry Stronghill
MINFILE GEOLOGIST R. Zuran/casual
ENVIRONMENTAL GEOLOGIST K. Pelletier
STAFF GEOLOGIST (Placer) W. Lebarge
MINFILE GEOLOGIST S. Traynor/casual
STAFF GEOLOGIST (Lode) M. Burke
PUBLICATIONS MANAGER ½ D.Emond
OFFICE MANAGER A. Wagner
MINFILE GEOLOGIST R. Deklerk
MINERALS GEOLOGIST ½ J. Hunt
SURFICIAL GEOLOGIST J. Bond

Northwest Territories Geoscience Organization Chart 2001

Northwest Territories
C.S. Lord Northern Geoscience Center



Government Geoscience in Nunavut



Nunavut Geoscience Organization Chart 2001

PROVINCIAL GEOLOGICAL SURVEY EXPENDITURES 2000-2001 FINAL & 2001-2002 PRELIMINARY

Provincial/Territorial Geological Survey Expenditures 2000-2001

Province/Territory	Survey Expenditures**	% of Canada Total	2001 Provincial Mineral Production*	Survey Expenditures as percentage of Provincial Mineral Production	Area Prov/Terr km²	Survey Expenditures $ per km²	Population 2001	Survey Expenditures per Capita
BRITISH COLUMBIA	$3,995,150	5.58%	$2,870,594,000	0.139%	944,735	$4.23	3,907,738	$1.02
ALBERTA	$5,150,541	7.19%	$49,832,486,000 *	0.010%	661,848	$7.78	2,974,807	$1.73
SASKATCHEWAN	$2,869,550	4.00%	$2,446,198,000	0.117%	651,036	$4.41	978,933	$2.93
MANITOBA	$4,320,300	6.03%	$902,021,000	0.479%	647,797	$6.67	1,119,583	$3.86
ONTARIO	$20,105,400	28.06%	$5,504,260,000	0.365%	1,076,395	$18.68	11,410,046	$1.76
QUEBEC	$16,430,400	22.93%	$3,490,201,000	0.471%	1,542,056	$10.65	7,237,479	$2.27
NEW BRUNSWICK	$2,233,000	3.12%	$789,196,000	0.283%	72,908	$30.63	729,498	$3.06
NOVA SCOTIA	$1,956,520	2.73%	$292,377,000	0.669%	55,284	$35.39	908,007	$2.15
PRINCE EDWARD ISLAND	$0	0.00%	$4,586,000	n/a	5,660	$0.00	135,294	n/a
NEWFOUNDLAND & LABRADOR	$5,478,552	7.65%	$831,753,000	0.659%	405,212	$13.52	512,930	$10.68
YUKON	$3,055,894	4.26%	$43,126,000	7.086%	482,443	$6.33	28,674	$106.57
NORTHWEST TERRITORIES	$2,667,000	3.72%	$905,504,000	0.295%	1,146,106	$1.98	37,360	$71.39
NUNAVUT	$3,391,000	4.73%	$319,217,000	1.062%	2,093,190	$1.62	26,745	$126.79
Canadian Totals:	**$71,653,307**	**100.00%**	**$68,231,519,000**	**0.105%**	**9,984,670**	**$7.18**	**30,007,094**	**$2.39**

* *Source: NRCan: Preliminary Estimate of the Mineral Production of Canada, by Province, 2001*
Provincial mineral production figures include metals, non-metals, structural materials and coal.
* *Alberta figures also include natural gas, natural gas by-products and crude oil.*
** *Does not include expenditures on Industry Grant Programs (e.g. Prospectors Assistance) see Table 2 for details on grants.*
Expenditures column includes a total of A-base funds and other funds available to the geological surveys.
Note: *Direct comparisons between jurisdictions are difficult due to the variety of budget/program components and methods of reporting data.*

Provincial/Territorial Industry Grant Programs

2000-2001 Final

Province/Territory	Prospectors Assistance	Mineral Exploration Assistance	Total
BRITISH COLUMBIA	$500,000	n/a	$500,000
ALBERTA	n/a	n/a	n/a
SASKATCHEWAN	n/a	n/a	n/a
MANITOBA	$106,351	$2,750,000	$2,856,351
ONTARIO		$500,000	$500,000
QUEBEC	$2,107,420	$10,007,080	$12,114,500
NEW BRUNSWICK	$90,000	$350,000	$440,000
NOVA SCOTIA	$171,162	$0	$171,162
NEWFOUNDLAND	$405,000	$1,845,000	$2,250,000
YUKON	$313,941	$371,911 *	$685,852
NORTHWEST TERRITORIES	$75,000	$0	$75,000
NUNAVUT	$150,000	$0	$150,000.0
Totals:	**$3,918,874**	**$15,823,991**	**$19,742,865**

* *Yukon Target Evaulations*

Provincial Geological Survey Expenditures

2001-2002 Preliminary Estimates

Province/Territory	Survey Expenditures	% of Total	Industry Grant Programs	Totals
BRITISH COLUMBIA	$4,098,500	5.85%	$500,000	$4,598,500
ALBERTA	$5,553,310	7.93%	$0	$5,553,310
SASKATCHEWAN	$3,600,000	5.14%	$0	$3,600,000
MANITOBA	$4,975,700	7.10%	$2,875,000	$7,850,700
ONTARIO	20,605,000	29.41%	$2,500,000	$23,105,000
QUEBEC	$15,274,000	21.80%	$13,501,800	$28,775,800
NEW BRUNSWICK	$2,502,300	3.57%	$600,000	$3,102,300
NOVA SCOTIA	$1,803,600	2.57%	$77,000	$1,880,600
NEWFOUNDLAND	$3,750,848	5.35%	$2,250,000	$6,000,848
YUKON	$3,070,750	4.38%	$758,000	$3,828,750
NORTHWEST TERRITORIES	$2,427,000	3.46%	$308,000	$2,735,000
NUNAVUT	$2,400,000	3.43%	$150,000	$2,550,000
Canadian Total:	**$70,061,008**	**100.00%**	**$23,519,800**	**$93,580,808**

Province: British Columbia 2000-2001

	Funding Agency	Number of Projects	Permanent Positions	Casual Positions	Salaries	Operational	Total $
Mineral Activities							
Bedrock geological surveys	GSB	7	8.5		$651,107	$274,500	$925,607
Geochemical surveys	GSB	2	2.5		$172,000	$113,000	$285,000
Surficial geology surveys	GSB	4	2		$149,421	$50,000	$199,421
Mineral deposit studies	GSB	5	5		$365,657	$124,800	$490,457
Mineral inventory compilations	GSB		2.75		$152,017	$25,000	$177,017
Industrial mineral studies	GSB	1	1		$80,976	$45,000	$125,976
Vancouver Regional Office	GSB		1		$187,790	$24,500	$212,290
District Geologists	Mines Br		4		$309,043	$50,767	$359,810
Sub total		**19**	**24.75**	**0**	**$1,758,968**	**$656,800**	**$2,415,768**
Energy Activities							
Coal	GSB	1	1		$78,468	$22,000	$100,468
Sub total		**1**	**1**	**0**	**$78,468**	**$22,000**	**$100,468**
Other Activities							
Terrain Map Library	FRBC		1		$67,469	$112,531	$180,000
Mineral Resource Assesment	CRI		1		$120,500	$158,500	$279,000
Map Production/Mapplace	GSB	2	1		$75,124	$95,000	$170,124
Laboratory	GSB		0.5		$37,918	$16,000	$53,918
Admin/Mgmt	GSB		10.75		$678,985	$311,951	$990,936
Sub total		**0**	**12.25**	**0**	**$792,027**	**$422,951**	**$1,214,978**
Miscellaneous							
Publications	GSB		1.75		$108,643	$24,000	$132,643
Information/assessment files	GSB		1.25		$80,293	$10,000	$90,293
Research Grants	GSB					$41,000	$41,000
Sub total		**0**	**3**	**0**	**$188,936**	**$75,000**	**$263,936**
Total Mineral Survey Activities		**20**	**41**	**0**	**$2,818,399**	**$1,176,751**	**$3,995,150**

(GSB Base Budget)

Funding Agency Abbreviations

**GSB - Geological Survey Branch CRI - Corporate Resource Inventory Initiative; Mines Br. - Mines Branch; FRBC - Forest Renewal B.C.*

Province: Alberta 2000 - 2001

	Agency	Funding	Projects	Person Years Perm.	Person Years Casual	Salaries ($) Perm.	Salaries ($) Casual	Operating Expenditures	Total ($)
Mineral Activities									
Geochemical Surveys	EUB	EUB	2	2	0.75	$154,988	$8,500	$91,500	$254,988
Bedrock Geology	EUB	EUB	3	4	1.00	$265,452	$20,000	$168,300	$453,752
Mineral Investigations (Field)	EUB	EUB	4	3	0.50	$240,560	$7,800	$213,606	$461,966
Industrial Minerals	EUB	EUB	2	5	0.50	$326,312	$12,000	$42,400	$380,712
Core Repositories	EUB	EUB	1	1		$31,264	$0	$8,750	$40,014
Energy Activities									
Oil, Gas, and Coal	EUB	2	6	12.75	3.50	$825,751	$155,000	$331,430	$1,312,181
Other Activities									
Hydrogeology	EUB	1	3	5		$352,344	$0	$71,900	
Geoscience Information System	EUB	EUB	2	7	0.75	$472,895	$6,700	$72,000	$551,595
Chief's Office / Administration	EUB	EUB	6	5.8	0.25	$398,245	$3,000	$912,803	$1,314,048
Laboratories	EUB	EUB	1	1	0.50	$60,828	$2,500	$8,750	$72,078
Miscellaneous									
Library	EUB	EUB	1	1	0.25	$43,432	$3,000	$50,000	$96,432
Publication / Data Sales	EUB	EUB	4	1	1.00	$43,000	$23,000	$102,400	$168,400
Other	EUB	EUB	2	0.25		$29,375	$0	$15,000	$44,375
Totals:				**48.8**	**9.00**	**$3,244,446**	**$241,500**	**$2,088,839**	**$5,150,541**

1 = EUB / WEPA

2 = EUB/AB, CASKA

Province: Saskatchewan 2000-2001

		Positions #py's		Salaries		Operational	Total
	# Projects	Permanent	Non-permanent	Permanent	Non-permanent	$	$
Mineral Activities							
Bedrock Geology Survey	6	5	4	$340,850.00	$122,798.00	$336,557.00	$800,205
Mineral Investigations	2	1	0	$62,770.00	$0.00	$17,974.00	$80,744
Mineral Deposit Invertory	1	0.5	0	$27,760.00	$0.00	$0.00	$27,760
Industrial Mineral Studies	2	1	0.4	$63,340.00	$9,700.00	$24,342.00	$97,382
District Geologists	n/a	1.75	0	$108,920.00	$0.00	$0.00	$108,920
Core Depositories	1	0.25	0.3	$17,230.00	$7,730.00	$11,890.00	$36,850
Mineral Resource Assessment	1	2	0	$105,660.00	$0.00	$8,568.00	$114,228
Energy Activities							
Oil/gas	n/a	8.4	2.4	$318,170.00	$74,343.00	$6,672.00	$399,185
Core Depositories	1	6.1	1.5	$184,559.00	$59,383.00	$15,000.00	$258,942
Subsurface analysis	4	3.8	2	$235,461.00	$76,478.00	$40,915.00	$352,854
Other Activities							
Chief's Office/Administration	n/a	2	0	$104,930.00	$0.00	$165,655.00	$270,585
Miscellaneous							
Publications	n/a	1.7	0	$81,418.00	$0.00	$37,141.00	$118,559
Information/Assessment Files	n/a	0.5	0.8	$27,760.00	$32,000.00	$2,341.00	$62,101
Other - GIS/Computerization	n/a	1	1.4	$64,730.00	$40,460.00	$36,045.00	$141,235
Grand Total	**18**	**35**	**12.8**	**$ 1,678,828.00**	**$ 382,432.00**	**$ 667,055.00**	**$2,869,550**

Province: Manitoba 2000-2001

PROGRAMS	Survey agency	Funding agency	No. of projects or facilities	Person years		Salaries		Operating	TOTAL
				Permanent	Non-permanent	Permanent	Casual		
MINERAL ACTIVITIES									
Bedrock Geology Surveys	MGS	MB	41	11:00	3:06	$726,300	$82,100	$237,600	$1,046,000
Geochemical Surveys	MGS	MB	4	2:00	0:39	$147,400	$21,600	$284,900	$453,900
Surficial Geology Surveys	MGS	MB	5	2:20	0:38	$141,200	$13,300	$23,300	$177,800
Geophysical Surveys	MGS	MB	2	1:00	-	$69,900	-	$13,900	$83,800
Mineral Investigations (Field)	MGS	MB	10	2:00	0:37	$136,700	$21,500	$99,700	$257,900
Mineral Deposit Analysis/Inventory	MGS	MB	5	2:00	-	$121,000	-	$1,300	$122,300
Industrial Minerals	MGS	MB	4	1:00	-	$62,400	-	$3,400	$65,800
District Geologists	MGS	MB	4	4:26	-	$229,300	-	$32,200	$261,500
Core Repositories	MGS	MB	6	0:00	-	$0	-	$6,100	$6,100
ENERGY ACTIVITIES									
Coal/Peat	-	-	-	-	-	-	-	-	-
Oil & Gas	-	-	-	-	-	-	-	-	-
Core Repositories	-	-	-	-	-	-	-	-	-
Subsurface Analysis	-	-	-	-	-	-	-	-	-
OTHER ACTIVITIES									
Environment/Land Use	MGS	MB	3	0:26	-	$30,700	$0	$2,200	$32,900
Hydrology	MGS	MB	-	-	-	-	-	-	-
Laboratories	MGS	MB	3	4:00	0:00	$152,700	$0	$24,400	$177,100
Miscellaneous Activities	MGS	MB	11	8:00	0:00	$409,400	-	$187,900	$597,300
Chiefs Office/Administration	MGS	MB	14	8:00	0:21	$420,500	$13,700	$603,700	$1,037,900
MISCELLANEOUS									
Library	-	-	-	-	-	-	-	-	-
Publications	-	-	-	-	-	-	-	-	-
Prospectors Assistance	-	-	-	-	-	-	-	-	-
Information/Assessment Files	-	-	-	-	-	-	-	-	-
Research Grants	-	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-	-
TOTALS	**-**	**-**	**112**	**46:20**	**5:37**	**$2,647,500**	**$152,200**	**$1,520,600**	**$4,320,300**

MGS - Manitoba Geological Survey

Province: Ontario 2000-2001

	Funding Agency	No. of Projects or Facilities	Staff		Salaries	Operating Expenditures *(incl. Benefits)*	Totals
			Permanent	Contract			
Mineral Activities							
Bedrock Geology Surveys	MNDM	13	20.0	7.5	$1,485,000	$889,000	$2,374,000
Geochemical Surveys	MNDM	2	2.0	3.0	258,000	191,000	$449,000
Surficial Geology Surveys	MNDM	5	4.0	2.5	304,400	106,000	$410,400
Mineral Investigations (field)	MNDM	5	3.5	2.0	263,600	79,400	$343,000
Mineral Deposit Analysis and/or Inventory	MNDM	1	1.0		63,100	22,000	$85,100
Industrial Minerals	MNDM	4	4.0	1.5	282,000	170,000	$452,000
Resident & District Geoogists	MNDM	10	43.5		1,785,900	817,900	$2,603,800
Core Repositories	MNDM	5	2.0		82,400	38,000	$120,400
Geophysical Surveys	MNDM	1	1.0		63,100	32,000	$95,100
Other Activities							
Geoscience Assessment	MNDM		5.0		246,500	72,500	$319,000
Environment/Land Use	MNDM		3.0		180,500	42,000	$222,500
Laboratories	MNDM		17.0	8.0	1,134,000	840,000	$1,974,000
Miscellaneous Details							
Library	MNDM		1.0		35,400	26,000	$61,400
Publications	MNDM		5.0		247,000	238,000	$485,000
Data Services	MNDM		8.0		528,500	582,200	$1,110,700
sub-totals:			**120.0**	**24.5**	**$6,959,400**	**$4,146,000**	**$11,105,400**
Additional Initiatives							
Ontario Treasure Hunt	MNDM	12			600,000	8,400,000	9,000,000

MNDM - Ministry of Northern Development & Mines

Total: **$20,105,400**

Province : Québec 2000-2001

Programmes	Financement	Nb de projets	Employés		Salaires		Dépenses d'opération	Total
			Permanents	Occasionnels	Permanents	Occasionnels		
			(équivalent à temps complet)		$		$	$
Activités géominières								
Cartographie géologique	MRN	11	26.38	48.07	$1,434,400	$1,665,000	$4,804,200	$7,903,600
Levés/études géochimiques	MRN							
Levés/études géophysiques	MRN							
Levés/études géologie de surface	MRN							
Recherche en métallogénie (terrain)	MRN	13	10.35	7.58	$637,800	$307,600	$618,700	$1,564,100
et gîtologie	MRN							
Évaluation de potentiel minéral	MRN	2	1.16	0.09	$68,000	$4,100	$22,600	$94,700
Minéraux industriels	MRN	3	0.85	0.12	$58,500	$6,500	$37,900	$102,900
Bureaux régionaux	MRN		21.08	2.71	$760,000	$91,700	$215,000	$1,066,700
Promotion du potentiel minéral	MRN		6.66	2.92	$352,500	$111,400	$453,200	$917,100
Compilations géominières	MRN		6.09	14.01	$270,500	$555,900	$37,900	$864,300
Autres activités								
Administration/bureau du géologue en chef	MRN		23.98	13.70	$1,038,500	$382,300	$1,831,900	$3,252,700
Divers			1.47	0.11	$82,200	$4,100	$345,700	$432,000
Promotion et marketing	MRN							
Publications								
Autres (SIGÉOM-GIS)								
Sous total		29	98.02	89.31	$4,702,400	$3,128,600	$8,367,100	$16,198,100
Assistance financière à l'exploration minière	MRN	375	3.04	1.50	$170,700	$61,300	$12,114,500	$12,346,500
Grand total		**404**	**101.06**	**90.81**	**$4,873,100**	**$3,189,900**	**$20,481,600**	**$28,544,600**

Province: New Brunswick 2000-2001

	No. of Projects	Staff			Salaries	Operating	Total
		Perm.	Casual	Contract			
Geological Surveys Branch							
Bedrock Geology	7	3.0	0.5	2.0	$277,700 [1]	$101,200 [1]	$378,900
Surficial Geology and Till Geochemistry	4	5.0	0.5		$267,800	$113,300	$381,100
Mineral Deposits	2	1.0	0.3	1.0	$105,500	$27,800	$133,300
GIS and Digital Technology	4	3.0	0.3		$120,100	$43,200	$163,300
Regional Geologists (Administration)	2	7.0	0.3		$313,400	$75,500	$388,900
Drill Core	3	1.0			$55,400	$68,900 [2]	$124,300
Editorial	1	1.0			$55,700	$5,900	$61,600
Director's Office	1	1.0			$69,000	$7,800	$76,800
Geophysics (Airborne)	1					$0	$0
Industrial Minerals	3	3.0			$177,000	$25,400	$202,400
Publications, Education (Mines Branch)	5	4.0			$158,000	$86,100 [3]	$244,100
Oil, Gas, Oil Shale	1	1.0	0.2		$65,600	$12,700	$78,300
Total	**34**	**30.0**	**2.1**	**3.0**	**$1,665,200**	**$567,800**	**$2,233,000**

[1] *Includes $75,000 funding from N.B. Regional Development Corporation*

[2] *Includes $60,000 funding from N.B. Regional Development Corporation*

[3] *Includes $25,000 funding from N.B. Regional Development Corporation*

Province: Nova Scotia 2000-2001

	Survey Research Agency	Funding Agency	No. of Projects or Facilities	Employees* Permanent	Employees* Casual	Operating* Expenditures	Salaries*	Totals*
Mineral Activities								
Bedrock Geology Surveys	MERD	NSDNR	5	5.0	0.5	$32,100	$307,705	$339,805
Geochemical Surveys	MERD	NSDNR	2	1.0		$10,000	$59,976	$69,976
Surficial Surveys	MERD	NSDNR	1	1.0		$10,000	$69,115	$79,115
Geophysical Surveys								
Mineral Investigations (Field)	MERD	NSDNR	3	4.0	0.3	$15,000	$250,319	$265,319
Mineral Deposit Analysis/Inventory	MERD	NSDNR	2	2.5		$15,000	$148,596	$163,596
Industrial Minerals	MERD	NSDNR	2	2.0		$20,000	$114,129	$134,129
District Geologists	RSB	NSDNR						
Core Repositories	MERD	NSDNR	1	2.0		$10,000	$115,957	$125,957
Energy Activities								
Coal/Peat	MERD	NSDNR	2	1.5		$15,000	$91,389	$106,389
Oil and Gas	PD							
Core Repositories	PD							
Subsurface Analysis	PD							
Other Activities								
Environmental / Land Use								
Hydrology	DOEL							
Laboratories								
Miscellaneous Activities - Mineral Promotion	MERD	NSDNR	n/a	1.0		$20,000	$69,115	$89,115
Chief Geologist's Office/Administration	MERD	NSDNR	n/a	1.5		$33,000	$96,550	$129,550
Miscellaneous Details								
Library	PS	NSDNR	n/a					
Publications	MERD	NSDNR	n/a	4.5		$20,000	$172,810	$192,810
Public Awareness/Prospectors Training	MERD	NSDNR	n/a	1.0		$5,000	$54,763	$59,763
Information/Assessment Files	MDMD	NSDNR						
Research Grants								
Informaton Technology	MERD	NSDNR	n/a	2.0	0.5	$36,600	$164,396	$200,996
Totals				**29.0**	**1.3**	**$241,700**	**$1,714,820**	**$1,956,520**

** = FTEs and budget data provided for MERD only, salary data include permanent and casual employees*

MERD = Mineral and Energy Resources Division *PD = Petroleum Directorate*

MDMD = Mineral Development and Management Division *PS = Policy and Planning Secretariat*

RSB = Regional Services Branch *DOEL = Department of Environment and Labour*

Province: Newfoundland & Labrador 2000-2001

	Survey Research Agency	Funding Agency	No. of Projects/ Facilities	Permanent[1] SMY	Casual SMY	Salaries Permanent $	Salaries Contract[1] $	Salaries Casual $	Operating Expenditures $	Totals $
Mineral Activities										
Bedrock geology surveys	GSNL	NDME	10	10	3	$547,090		$49,945	$389,337	$986,372
Geochemical surveys	GSNL	NDME	4	3	1	$168,715		$14,487	$20,997	$204,199
Surficial geology surveys	GSNL	NDME	3	2	1	$112,526		$21,661	$76,013	$210,200
Geophysical surveys	GSNL	NDME	1	1		$50,365			$60	$50,425
Mineral investigations (field)	GSNL	NDME	4	3	1	$169,558		$23,431	$82,793	$275,782
Mineral deposit analysis &/or inventory	GSNL	NDME	1	4		$96,451	$41,369		$2,907	$140,727
Industrial minerals	GSNL	NDME	2	2		$101,633		$6,646	$12,062	$120,341
District geologists	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Core repositories	MLD	NDME	1	2	1	$105,476		$9,435	$50,217	$165,128
Energy Activities										
Coal/Peat										
Oil & Gas	EB	NDME	2	21		$922,797	$355,900		$350,200	$1,628,897
Core Repositories										
Subsurface Analysis										
Other Activities										
Environment/Land Use	MLD	NDME	1	4		$121,366	$25,554		$35,234	$182,154
Hydrology										
Laboratories	GSNL	NDME	1	4		$148,517			$53,857	$202,374
Miscellaneous Activities										
Director's Office/Admin.	GSNL	NDME	2	8	1	$272,357	$47,398	$7,701	$192,615	$520,071
Miscellaneous										
Library	GSNL	NDME	1	3*	0.5	$45,743		$3,928	$6,221	$55,892
Publications/Cartography	GSNL	NDME	2	8	1	$344,672	$8,432		$41,791	$394,895
Information/Assessment Files	GSNL	NDME	2	4		$179,744			$55,051	$234,795
Research Grants										
Information Technology	GSNL	NDME	1						$106,300	$106,300
TOTALS			**38**	**79**	**10**	**$3,387,010**	**$478,653**	**$137,234**	**$1,475,655**	**$5,478,552**

Notes *GSNL - Geological Survey of Newfoundland and Labrador*
MLD - Mineral Lands Division; EB - Energy Branch; MB - Mines Branch
NDME - Newfoundland Department of Mines and Energy
1 - includes long-term temporary staff
** - includes one employee sponsored by Opening Doors Program*

TOTAL GEOLOGICAL SURVEY ACTIVITIES 2000-2001 (GSNL).... $3,502,373

TOTAL GEOLOGICAL SURVEY ACTIVITIES 2001-2002 (GSNL).... $3,750,848

Territory: Yukon 2000-2001

	Research Agency	Funding Agency	Projects	Positions		Operating Expenditures
				Permanent	Casual	
Mineral Activities						
Bedrock Geological Surveys	YTG	INA/YTG	4	3	2.5	$541,633
	GSC	INA/YTG/GSC	1	1	0	$6,000
Mineral Deposit Studies	INA	INA/YTG	1	1	0.25	$40,411
	YTG	INA/YTG	1	1	0.5	$137,229
Surficial Geology	YTG	INA/YTG	1	0	0	$144,575
	YTG	INA/YTG	1	0	0	$31,185
	INA	INA	1	1	1	$85,390
	YTG	INA/YTG	1	0	0	$17,500
Till Geochemistry	INA	INA/YTG	1	1	0.25	$126,066
Stream Geochemistry	YTG	YTG				$250,000
Mineral Resource Assessments	YTG	YTG	3	1	2.75	$320,000
Mineral Deposit Inventory	INA	INA	1	0.75	0.25	$89,630
	YTG	INA/YTG	1	0	0.75	$15,000
	YTG	**INA**	1			$10,000
District Geologists	INA	INA	1	1	0	$72,215
Core Repositories	INA	INA	1	0.25	0.25	$52,914
Energy Activities						
Oil & Gas Resource Assessments	YTG/NEB	YTG	2	0	0	$200,000
Other Activities						
Chief Geologist/Administration	YTG	INA/YTG	2	1	0	$227,134
	YTG	YTG	1	1	0	$85,000
Ch.Geol/Admin/Travel/Training	INA	INA	1	1.5	0	$308,725
Miscellaneous						
Library	INA	INA	1	0	0	$35,000
Cartography/Publications	INA	INA	1	0.5	0.25	$72,487
	YTG	INA/YTG	1	1	0	$74,300
	YTG	INA/YTG	1	1	0	$72,200
Assessment Files	INA	INA	1	0.25	0	$6,000
Research (thesis support)	YTG	INA/YTG	5	0	0	$35,300
Total			**36.0**	**12.3**	**2.5**	**$3,055,894**

Territory: Northwest Territories 2000-2001

	Funding Sources	Number of Projects	Personnel	Operations & Management (DIAND & GNWT)	Salary
Mineral Activities					
Bedrock geology surveys	A base	2	1.5	$350,000	$140,000
Geochemical surveys	n/a				
Surficial geology surveys	n/a				
Geophysical surveys	n/a				
Mineral investigations (field)	A base	3	3.2	$303,000	$270,000
Mineral deposit analysis/inventory	A-base	1	3		$250,000
Industrial minerals	n/a				
District geologists	A-base		2.8	$36,000	$210,000
Core repositories	n/a			$2,000	
Energy Activities					
Coal/Peat	n/a				
Oil & Gas	A-base		2	$50,000	$180,000
Core Repositories	n/a				
Subsurface analysis	n/a				
Other Activities					
Environmental/Land use	PAS-funding	2	2	$65,000	$180,000
Hydrology	n/a				
Laboratories	n/a				
Miscellaneous Activities	n/a				
Chief Geologists Office/Admin	A-base		3	$50,000	$200,000
Miscellaneous Details					
Library			1	$30,000	$60,000
Publications	A-base		2.5	$8,000	$170,000
Information/Assessment files	A-base		0.5	$13,000	$40,000
Research Grants	n/a				
Other					$70,000
Sub-Totals:				$907,000	$1,770,000
Total:					**$2,677,000**

Territory: Nunavut 2000-2001

	Funding Agency	Number of Projects	Positions (Term)	Salaries	Operating	Total
Mineral Activities						
Bedrock geological surveys	C-NGO	2	2.0	$140,000	$700,000	$840,000
Geochemical surveys	GSC (TGI)	1	0.5	$30,000	$120,000	$150,000
Surficial geological surveys	C-NGO	1	1.0	$45,000	$70,000	$115,000
Geophysical surveys	GSC (TGI)	1	0.0	$0	$800,000	$800,000
Mineral investigations (field)	C-NGO	3	2.0	$130,000	$150,000	$280,000
Mineral deposit analysis/ inventory	DIAND	1 (NORMIN)	1.0	$50,000	$40,000	$90,000
Industrial Minerals	n/a	n/a	0.0	$0	$0	$0
District Geologists	DIAND	2	3.0	$220,000	$40,000	$260,000
Core depositories	DIAND	1	0.0	$0	$5,000	$5,000
Energy Activities						
Coal/ Peat	n/a	n/a	n/a			
Oil & Gas	n/a	n/a	n/a			
Core depositories	n/a	n/a	n/a			
Subsurface analysis	n/a	n/a	n/a			
Other Activities						
Environment/ Land Use	n/a	n/a	n/a			
Hydrogeology	n/a	n/a	n/a			
Laboratories	C-NGO	5 (GIS)	2.0	$110,000	$30,000	$140,000
Miscellaneous Activities	C-NGO	3 (Outreach)	0.5	$22,000	$10,000	$32,000
Chief Geologist's Office/ Admin.	C-NGO	n/a	1.0	$40,000	$50,000	$90,000
Miscellaneous Details						
Library	C-NGO	n/a	n/a	$0	$20,000	$20,000
Publications	C-NGO	n/a	n/a	$0	$5,000	$5,000
Information/ Assessment files	DIAND	n/a	1.5	$90,000	$55,000	$145,000
Research Grants	n/a	n/a	n/a	$0	$0	$0
Other (Relocation costs, housing)	C-NGO, DIAND	n/a	n/a	$0	$419,000	$419,000
Total			**14.5**	**$877,000**	**$2,514,000**	**$3,391,000**

Geological Program Highlights 2001

Overview

In 2001 the British Columbia geoscience program continued to serve government objectives in areas of economic development and land and resource management. The new Government in British Columbia demonstrated its commitment to mining by improving and harmonizing the 20% BC Exploration Tax Credit with the Federal Exploration Investment Tax Credit in 2001. British Columbia now has one of the most attractive exploration incentive programs in Canada. In 2001, companies, geologists and prospectors increased their research on British Columbia's mineral and coal exploration potential and many acquired ground in anticipation of better days ahead.

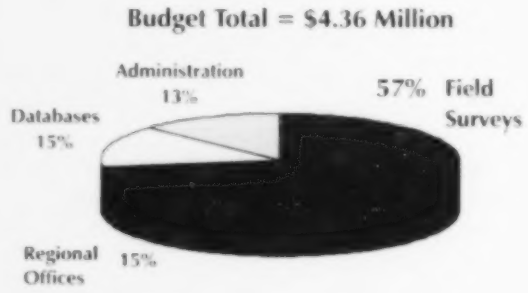
Budget

Base funding allocation for the British Columbia Geological Survey (GSB) was $4.0 million in 2001/02, similar to the previous year. The Regional Geologists Program was funded by the Mines Branch at $360 000. The base budget was supplemented by $235 000 from other government agencies for inventory projects in areas of active land use planning.

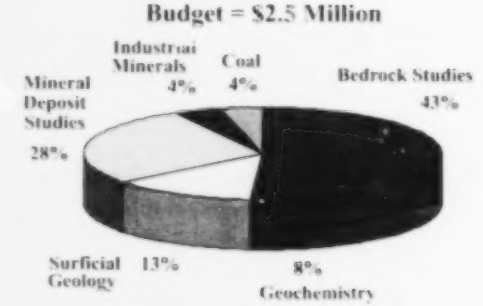
$2.5 million, which is 57% of the total geoscience program budget, was allocated to field projects, namely bedrock mapping ($1.15 million), mineral deposit studies ($748 000), geochemical and surficial surveys ($571 600), industrial mineral studies and coal studies ($215 000) (Fig. 1b). A total of 20 field projects were undertaken in 2001. Because of tight budgets most field projects were two person crews with limited helicopter support, except for those that were partnered with the Geological Survey of Canada.

15% of the budget was allocated to maintaining and developing the Branch's geoscience databases, such as Minfile, Aris, and Mineral Potential (Fig. 1c). These are the "backend", underpinning databases to the successful internet portal, the MapPlace. 15% of the budget was spent on delivering regional geology services through the Vancouver Mineral Development office and the five Regional Geologists located in mining centers throughout the Province. The Regional Geologists provide assistance and advice to explorationists, prospectors and land planners, monitor and report on exploration and mining activities, evaluate applications for grants under the Prospectors Assistance Program, and conduct property examina-

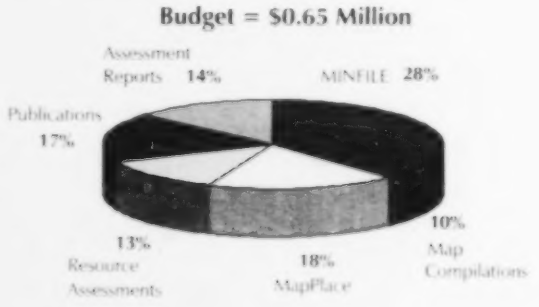
Budget allocation by activity.



Field Activities Budget.



Database Management Budget.



tions and research. 13% of the budget was spent on administration and office overhead costs.

New Initiatives

In 2001 the GSB and the GSC held two geoscience needs workshops with industry clients and university partners to identify the knowledge gaps and to develop priorities for survey work in both minerals and petroleum geology. The resulting five-year plans were published as Open File Reports and have been posted on the Ministry's Internet site. They will help guide future survey work by both federal and provincial Surveys within the Province.

The Geological Survey of Canada's three year $15 million, Targeted Geoscience Initiative (TGI) was in its second year and two new field projects were initiated in BC. The projects were jointly planned, funded and delivered and the pooling of resources and staff expertise permitted extensive fieldwork to be completed.

BC is participating with the GSC and the other Provincial surveys in building the Canadian Geoscience Knowledge Network. All of the Surveys have committed to adopting common standards and data management tools so that clients can have Internet access to a seamless network of Canadian geoscience information. In 2001 work began on creating a metadata catalogue of BC geoscience data.

Economic Development Program

Most of the Survey's field programs were concentrated on attracting mineral exploration investment to under-explored frontier regions, or areas with established mining infrastructure. Three new field projects were carried out in the Harrison Lake area in 2001, which is a current focus of exploration activity for base metals, platinum group metals and for magnesium. New field mapping projects were initiated in the Atlin and Bella Coola areas in conjunction with the GSC's TGI program. The GSB started one new program and continued work on a second to study pericratonic rocks, as part of the ongoing Ancient Pacific Margin NATMAP program, a joint venture with the Geological Survey of Canada, universities and industry. Other projects addressed a variety of aspects of provincial geology and mineral deposits, including PGEs in placer deposits and in the Moyie sills, Broken Hill-type deposits, intrusion-related gold potential, the Ecstall volcanogenic massive sulphide belt, coal and industrial minerals.

Harrison Lake Area

GSB staff initiated a multidisciplinary field study east of Harrison Lake around the former Giant Mascot mine and extending to the northwest. Most of the current exploration interest is focused on the potential for PGEs. Since January 2000 over 2000 claims have been staked in the area.

- ✔ Geological mapping by Chris Ash focused on mapping two transects across the East Harrison Lake belt and working in the area of the Giant Mascot mine. The mapping is being synthesized with a detailed assessment of the available data for the region and a revised lithotectonic framework for the belt has been established.
- ✔ The Giant Mascot copper-nickel mine, the province's only significant nickel producer, was studied with particular emphasis on determining the PGE content of the mineralization and its relationship to the host intrusions. Robert Pinsent's sampling shows that the mineralization contains several 100s of ppb Pt and Pd when recalculated to 100% sulphide content.
- ✔ Stream silt and moss samples were collected in the area as part of a geochemical orientation study by Ray Lett and Wayne Jackaman to determine the best sample media, sample density and size fractions to detect PGE mineralization.

TGI Projects

- ✔ The GSC started a three-year, multi-disciplinary project in the Atlin area, northwestern British Columbia in 2000 with a high-resolution, regional aeromagnetic survey. The aeromagnetic data was released in October 2001. Mitch Mihalynuk and his crew, including researchers from the University of Victoria, the The University of British Columbia and Université Claude Bernard (France), conducted bedrock mapping of two 1:50 000-scale map sheets in the southeastern pro-

British Columbia Geological Survey Operating Budget 2001-2002

FIELD SURVEYS	Funding Agency	Field Projects	Permanent Positions	Salaries	Operational	Total $
Bedrock geological surveys	GSB	7	9	710,200	440,362	1,150,562
Geochemical surveys	GSB/CRII	2	2	136,163	82,623	218,786
Surficial geology surveys	GSB/CRII	3	2	163,600	189,246	352,846
Mineral deposit studies	GSB	5	7.5	565,507	182,915	748,422
Industrial mineral studies	GSB	1	1	81,800	29,625	111,425
Coal	GSB	2	1	81,800	21,630	103,430
Sub total		**20**	**22.5**	**1,739,070**	**791,401**	**2,530,471**
REGIONALOFFICES						
Vancouver Regional Office	GSB		4	265,890	56,000	321,890
District Geologists	Mines Br		5	309,043	50,767	359,810
Sub total			**9**	**574,933**	**106,767**	**681,700**
DATABASE MANAGEMENT						
Mineral Inventory (Minfile)	GSB		2.75	156,874	24,000	180,874
Map Compilations	GSB			42,000	26,600	68,600
Mapplace	GSB		1	75,407	42,000	117,407
Mineral Resource Assesment	CRII		1	82,210		82,210
Publications/Website	GSB		2	98,389	15,000	113,389
Assessment Reports	GSB		1.25	80,973	10,000	90,973
Sub total		**0**	**8**	**535,853**	**117,600**	**653,453**
ADMINISTRATION and OVERHEAD						
Management	GSB		3	287,312	19,500	306,812
Adminstrative Support	GSB		4.5	193,213		193,213
Office Overhead (Victoria, Vancouver)	GSB				84,000	84,000
Sub total		**0**	**7.5**	**480,525**	**103,500**	**584,025**
Total GSB Base Budget		**20**	**42**	**2,939,128**	**1,068,501**	**4,007,629**

Funding Agency Abbreviations:

**GSB - Geological Survey Branch CRII - Corporate Resource Inventory Initiative, Mines Br. - Mines Branch*

ject area (104N/1 and 2). The map area is underlain mainly by oceanic crustal rocks and deep to shallow marine sedimentary rocks of the Cache Creek Terrane. It has received very little exploration activity and contains no reported mineral occurrences. However, the mapping revealed a magnetite exhalite unit, extending for more than 700 metres within volcanic ash tuff, plus submarine felsic volcanic rocks. Both are indicators of a favourable environment for the formation of volcanogenic massive sulphide mineralization.

✔ In 2001, the Bella Coola TGI involved 1:50 000-scale bedrock mapping by Bert Struick of the GSC and Larry Diakow of the GSB in an area north and northeast of Bella Coola. Diakow's work focused on the Jurassic volcanic and sedimentary rocks to identify volcanogenic massive sulphide targets, particularly in the area around the Nifty occurrence, which has Eskay Creek-style mineralization.

✔ Bella Coola (NTS 93D) and adjoining parts of Laredo Sound (NTS 103A) map sheet were the focus of a joint Federal-Provincial regional geochemical survey.

Ancient Pacific Margin NATMAP Project

✔ Near Cariboo Lake, Fil Ferri with Brian O'Brien, a visiting geologist from the Newfoundland Geological Survey, continued mapping Snowshoe Group rocks within the Barkerville Terrane. This mapping led to the discovery of a new copper showing and demonstrated that volcanic rocks which host the Frank Creek massive sulphide occurrence continue to the northwest. A new structural interpretation permits a revised and simpler stratigraphy for the Snowshoe Group.

✔ In the northern part of the province, northeast of Dease Lake, JoAnne Nelson initiated a mapping project to examine the Paleozoic rocks near Beale Lake. Her results show that these rocks in part correlate with the favourable Yukon-Tanana stratigraphy with potential for volcanogenic massive sulphides. A num-

ber of new mineral occurrences were found during the project.

- ✔ In the Revelstoke region, Trygve Hoy studied massive sulphide Broken Hill-type and Sedex deposits in the highly deformed and metamorphosed Monashee cover sequence. In 2001 he examined the Big Ledge, Navan, Finn, Vista and Ruddock Creek mineral occurrences. Stratigraphic relationships coupled with zircon dating suggest that some of the conformable sulphides are as old as 1.8 billion years.

Other Field Projects

- ✔ A mapping and mineral deposit project is ongoing in the Ecstall Belt located within the Coast Plutonic Complex, 70 kilometres southeast of Prince Rupert. Dani Alldrick has delineated prospective felsic volcanic facies and documented features for some of the 40 mineral prospects in the belt. Using geochronology, he has established the volcanic stratigraphy and demonstrated that most sulphide occurrences are hosted by a mid-Devonian metavolcanic unit.
- ✔ Graham Nixon continued his project to study Cu-PGE mineralization in alkaline plutonic complexes. In 2001 he completed work in southern British Columbia on the Sappho (Boundary Camp), Averill (Franklin Camp), Iron Mask (Afton deposit) and Allendale complexes with related studies on the mineral occurrences. Initial results show the Cu-PGE mineralization is at least partially magmatic and is associated with Jurassic-Triassic, not Eocene, age intrusions.
- ✔ Reconnaissance sampling of Moyie sills for PGEs in southeastern British Columbia resulted in a few anomalous samples.
- ✔ Mapping continued on the Bonaparte Map Sheet, west of Clearwater on the North Thompson River. Paul Schiarizza's mapping continues to produce major revisions to the existing geological maps, including identifying a prominent belt of Jurassic ultramafic-mafic-syenitic plutonic rocks that correlate with a suite of alkaline plutons of latest Triassic to earliest Jurassic age with associated base and precious metal mineral occurrences. Correlative rocks elsewhere along this magmatic belt host economic copper-gold porphyry deposits at Mount Polley, Afton and Copper Mountain, and gold skarns at Hedley.
- ✔ Gerry Ray completed his work on the controls of gold mineralization in the Barkerville Camp. He also examined the Lustdust property located north of Fort St. James where he documented proximal to distal metal zoning related to an Eocene intrusion with porphyry, skarn, and manto and vein mineralization. Other Eocene intrusions in central British Columbia, particularly adjacent to the Pinchi Fault, are expected to host similar mineralization.
- ✔ Surficial geology and till geochemical case studies at the Huckleberry Mine and Chisholm Lake porphyry prospect by Vic Levson modeled dispersal patterns of mineralization in glacial till over the deposits. These results will assist in interpreting complex ice-flow models and geochemical till data from the region.
- ✔ Vic Levson initiated a project to study the surficial geology of known PGE placer occurrences to try and determine their lode sources. Placer miners were requested to submit samples from concentrates for PGE analysis.

Regional Geochemical Surveys

Results of a stream sediment and water survey of the Ecstall greenstone belt were released in June 2001. In 2001 the area immediately south of this survey area, known as the Triumph Bay area, was sampled and results will be released in 2002. The surveys were funded by the Corporate Resource Inventory Initiative as a contribution to the ongoing North Coast Land and Resource Management Plan.

Coal

Interest in coal bed methane (CBM) continued to be high in 2001 and during the year the Province sold over $30 million of CBM exploration rights. As this resource is derived from coal seams, GSB staff have been active in providing information and advice to clients and Ministry executive. Derek Brown was seconded to lead the Coalbed Methane Strategy Initiative. Barry Ryan continued his CBM studies focusing on adsorption characteristics of Gething Formation coals in the northeast and desorption re-

sults from Comox coals on Vancouver Island. He also completed a study on Selenium in the Elk Valley.

Industrial Minerals

George Simandl focused his field efforts on industrial mineral property visits, including phosphate, travertine, tufa, flagstone, carbonatite, perlite and pumice occurrences throughout southern and central parts of British Columbia. He provided technical and marketing expertise to numerous clients attempting to develop industrial minerals in BC.

The GSB, in conjunction with the University of Victoria, Canadian Institute of Mining, Metallurgy and Petroleum, and Ministry of Energy and Mines, organized and delivered the "37th Forum on the Geology of Industrial Minerals," in Victoria, in May 2001. This international symposium had a strong focus on industrial mineral resources of British Columbia.

Regional Geology Program

The Regional Geologists (RGs) continued to lead and support the delivery of successful exploration conferences throughout the Province such as *Cordilleran Roundup, Minerals North, CIM Branch Meetings*, the *Kamloops Exploration Conference*, and the *Smithers Rock Talk*. Through posters and oral presentations, they promote BC's exploration and mining opportunities at national and regional meetings. In partnership with GSB staff, the RGs also organized and led short courses on VMS deposits (Kamloops), "Exploring the Map Place" (Kamloops, Vancouver) and field trips in the Merritt-Ashcroft, Little Fort, Eskay Creek, Snip, Golden Bear, Kemess, Huckleberry and the Smithers-Houston areas. Public outreach activities included participation in trade shows (*e.g.* Cariboo Mining and Forestry Show), school visits and, in conjunction with the Kamloops Exploration Group during Mining Week, a public tour to view the reclamation success at the Afton mine site.

The Regional Geologists are also responsible for producing "*Exploration and Mining in British Columbia*", an annual review of mineral activity. These reports continue the tradition of the valuable *Minister of Mines Annual Reports*, published since 1874.

Resource Management Program

The Branch received $110 000 from the Government's Corporate Resource Inventory Initiative (CRII) to complete aggregate potential mapping of the Sunshine Coast and the North Coast in support of Land and Resource Management Planning.

MapPlace

On going development and enhancement of the popular geoscience MapPlace web site continues. The site averages over 1100 hits per day. Improvements to the site include rewriting and updating many of the web pages; addition of a geochemistry tool to the Exploration Assistant; a new coal map with links to 250 coal assessment reports, a self-guided tour of Map Place, and a new BC Geology map including a Java version for Mac users. New data layers have been added for regional aeromagnetics, coal boreholes, and a digital elevation model. A number of training courses on navigating the MapPlace were held throughout the Province.

MINFILE - ARIS

Maintenance of the MINFILE database included updating deposit descriptions and addition of over 60 new occurrence descriptions. The MINFILE web pages have been updated with enhanced searches and extracts introduced. Assessment Reports are now being routinely scanned and posted to the website. A partnership with Heritage Resources Ltd. provided funding to scan 230 assessment reports from the Eskay Creek area.

Prospector Assistance

The Prospector Assistance program was funded at $500 000 in 2001. Fifty-two prospectors received grants worth more than $428 000 and spent more than 2200 prospecting days in the field. Prospectors in last year's program discovered a number of new mineral occurrences and five of them entered into work agreements with exploration companies totaling approxi-

mately $1 million. Three of the prospects were drilled in 2001. There is also ongoing exploration on Prospectors Assistance discoveries made in previous years. For example, a total of $850 000 was spent on the Lottie Lake property since its discovery in 1997.

Staffing News

Derek Brown, Manager of the Economic Geology Section was seconded to lead the Ministry's Coal Bed Methane Initiative. Barry Ryan, Andrew Legun and Vic Levson also devoted considerable time to this Initiative. Nick Massey served as Acting Manager of the Economic Geology Section for most of the year.

Maggie Dittrick was appointed to the Information Geologist position in the Branch's Vancouver office. With this appointment Robert Pinsent was reassigned to the field program and undertook field studies on the Harrison Lake project.

Forest Renewal BC cancelled its arrangement with the Branch to manage the Terrain Stability and Soils Database Project in April 2001. Pat Desjardins, the custodian of the database, was reassigned to the field program and later to the MapPlace.

David Terry was appointed the Regional Geologist for the Kootenay Region replacing Paul Wilton who retired after 19 years of service.

Minister's Technical Liaison Committee

The Minister's Technical Liaison Committee to the GSB met with Branch management in April 2001 to review the proposed work program. A report on their findings was sent to the Minister. The annual fall meeting was postponed until after the Government's plan to downsize the Ministry and refocus the work of the Branch in a public-private partnership model is announced in early 2002.

Alberta Program Highlights 2001

Overview

The Alberta Geological Survey has three Sections, Energy, Minerals and Geoscience Support, which contribute collectively to two major resource programs (Energy and Minerals) and other Survey activities. The AGS budget grew, largely from outside funding, from $4.6 million in 2000 to $5.2 million in 2001. There were 48.8 permanent staff and 9 casual manpower FTEs during the year.

The Energy Section developed and submitted successful proposals to the Alberta Science and Research Authority for the evaluation of coal-bed methane potential and production potential in Alberta, and for the evaluation of geological sequestration of CO_2. As well, they continued their study of groundwater and surficial geology in northeastern Alberta in support of oilsands development in this region.

The Minerals Section, in conjunction with the Geological Survey of Canada (GSC) and the C.S. Lord Northern Geoscience Centre, NWT, proposed and successfully obtained a Targeted Geoscience Initiative (TGI) program to study the Mississippi Valley Type Pb-Zn deposit potential in northern Alberta and the southernmost NWT. This is in addition to the GSC-AGS Geochemical Survey TGI in the Buffalo Head Hills area and the GSC-Saskatchewan Geological Survey-AGS-industry Athabasca Basin EXTECH IV TGI, both of which were begun in 2000. In addition to these programs in fiscal year 2001-02, the AGS completed surficial mapping at 1:250 000-scale of NTS mapsheet 84B, and kimberlite and selected other thematic studies. For the near future, the focus of the Minerals Program will continue to be the minerals potential in northern Alberta.

Energy Resources Program

The AGS concentrated its efforts in supporting the intensive energy development in the Athabasca Oilsands area in northeastern Alberta by improving the reservoir characterization of Alberta's oilsands, and identifying sources of water and of wastewater disposal sites for in-situ thermal projects. In response to the Ministry's needs, AGS is developing a long-term program to establish the potential for, and production potential of, coal-bed methane in Alberta. To meet government and industry needs and interest in meeting the CO_2 emission-reduction targets, AGS is studying the potential for CO_2 sequestration in geological media in Alberta.

Current projects are:

- ✔ Tectono-stratigraphy, aquifer characterization, and wastewater injection potential of the Paleozoic succession in the Athabasca Oilsands area;
- ✔ Facies analysis and mapping of the oilsands in northeastern Alberta, to characterize at the reservoir scale the geology of the Athabasca Oilsands Deposit;
- ✔ Geological and hydrogeological support in processing applications and in hearings regarding bitumen production in the Cold Lake and Athabasca areas: ESSO's Makheses expansion, CNRL Primrose and Wolf Lake expansions, OPTI Canada, Suncor's Firebag plant, and PanCanadian's Christina Lake plant;
- ✔ Baseline groundwater assessment of the Quaternary and Cretaceous succession, Athabasca Oil-Sands area (with funding from the Western Economic Partnership Agreement – WEPA - between the provincial and federal governments);
- ✔ Geological support to a consortium project led by the Alberta Research Council on CO sequestration in coal beds and concurrent enhanced coal-bed methane production (with funding from the Alberta Science and Research Authority - ASRA);
- ✔ Characterization of salinity and pressure regime of formation waters in Alberta, for the identification and characterization of specific sites suitable for CO sequestration in geological media near major CO producers throughout Alberta (with funding from ASRA).

Mineral Resources Program

Much of Alberta is underlain by the Alberta sedimentary basin, which is rich in energy resources. However, tectonic features and, in places, intrusions provide the conditions in which non-energy minerals, such as diamondiferous kimberlites, SEDEX base metal and Mississippi Valley type (MVT) lead and zinc deposits, may be found. In addition, the northeastern corner of Alberta, where the Precambrian Shield is exposed, provides an environment for possible deposits of copper, zinc, uranium, lead and silver.

Except for the Precambrian Shield in the extreme northeast, Alberta's geology is virtually unmapped at the level of detail, *i.e.*, 1:50 000 scale, needed for mineral exploration. The province has never had a significant investment in geological mapping for metallic and industrial minerals, except for some initial mapping through the $8.4 million Mineral Development Agreement (1992-1995) with the federal government. In 2000, Alberta committed additional funding for the AGS to increase geological mapping and geoscience studies. The expanded minerals program will initially concentrate its efforts in northern Alberta, which has definite mineral potential, and will provide information to the mineral industry on the topics which follow.

The mineral resources program focuses on studies of metallic/non-metallic minerals, including diamonds, industrial minerals, aggregate (sand and gravel) and basic regional studies, such as:

- ✔ Surficial geology of northern Alberta. Quaternary and surficial mapping at 1:250 000 scale, of the Pelican and Peerless map areas (83P and 84B). Maps and a brief report are in preparation for release by mid 2002;
- ✔ Quaternary stratigraphy, drift thickness and bedrock topography in northern Alberta;
- ✔ RADARSAT compilation and structural mapping of northern Alberta. Interpretation of RADARSAT-1 and Landsat TM5/7 imagery in northern Alberta to identify possible fault lineaments and their spatial relationship to known kimberlitic diatremes and metallic mineral occurrences;
- ✔ Geochemical surveys over exposed and buried kimberlitic pipes in northern Alberta. Orientation soil and bio-geochemical surveys over selected kimberlitic diatremes at the Buffalo Head Hills (84B), Birch Mountains (84H) and Mountain Lake (83N) areas;
- ✔ Compilation of structural data in northern Alberta. Provide a regional, state-of-the-art, GIS compilation and synthesis of the tectono-stratigraphic framework of northern Alberta, with emphasis on the metallic-mineral and diamond potential;
- ✔ Mississippi Valley-type (MVT) Pb-Zn carbonate project, northern Alberta Targeted Geoscience Initiative. This study is a joint study between the Alberta Geological Survey, C.S. Lord Northern Geoscience Centre, Cominco Ltd. and the Geological Survey of Canada. Alberta's contribution consists of field examination of Paleozoic carbonates; drill core evaluation for dolomitic, altered, structural or mineralized zones; identification of regional structural fabric, and a compilation of surficial geochemical and other pertinent data;
- ✔ EXTECH IV Targeted Geoscience Initiative – The Athabasca Basin and its Uranium Potential. This is a joint study between the Alberta Geological Survey, Saskatchewan Department of Energy and Mines, the Geological Survey of Canada, COGEMA and Cameco Ltd. Alberta's contribution to this study is to enhance the knowledge about the Athabasca sedimentary basin within Alberta and it's potential to host important uranium deposits;
- ✔ Sourcing of stratigraphic-structural information for northern Alberta. Improve the stratigraphic and structural understanding of the Paleozoic geology of northern Alberta by establishing the areal distribution of petroleum-industry seismic lines within the project area and determine how much of this information can be shared, or is in the public domain, for the construction of structural and stratigraphic cross-sections;
- ✔ Mineral-aggregate and industrial-minerals studies and mapping. Compilation in

digital form of previously completed aggregate mapping for parts of Alberta;

- ✔ Petrogenesis, geochemical and isotopic characterization of Alberta kimberlites.

Geoscience Support Section

This Section provides administrative, financial, clerical, communication and information technology support to the AGS Group. It also manages and operates the AGS Library and the Information Sales office.

The migration of the AGS information technology infrastructure from the OpenVMS platform to the Windows NT Server platform is continuing. The first databases have been successfully migrated from Ingres on OpenVMS to Oracle on NT. Further database migration will be performed as part of part of the AGS core business. In addition, in-house software applications for cartographic transform manipulation have been successfully ported to the NT platform. Windows NT based software applications for GIS, mapping, contouring, log analysis, x-sectioning, modeling and statistical analysis are now being used throughout the Survey.

As a member of the NEOS Library Consortium the AGS Library continues to offer higher levels of service to its patrons each year. Partly in response to the increasing cost of printed materials, both books and journals, the library is offering an increasing number of digital products and services, including full-text on-line journals, reference database searches and Web searches. A new library Web page can be found on the AGS Internet site.

The AGS Information Sales office continues to move towards distributing AGS' publications as digital products. All new publications will only be offered in digital format.

Legacy Information

Over the past decades, the Alberta Geological Survey (AGS) has amassed a large amount of geological data and information in a variety of forms, formats and media. Much of this has been stored in boxes, file cabinets, map drawers, offices of individual staff or in shared areas. The majority of this information, by volume, is on paper, acetate or Mylar®; however some of the more recent material is on magnetic media, mainly tapes. It also includes a large number of pictures, slides and graphic material. The information is stored in several places: off-site at the Mineral Core Research Facility, on-site in an archival room and in various work areas used by AGS staff. Past circumstances, such as staff turnover, physical moves of AGS offices, and the transfer of the AGS in 1995 from the Alberta Research Council to then to the Alberta Energy and Utilities Board in 1996, meant that much of this information was unavailable to the public.

Assessment Report Submissions in Alberta during 2000 and 2001

	Year 2000	Year 2001
Summary		
Number of permits worked on	1,138	242
Hectares worked	11,130,903	2,030,682
Work expenditures	$17,286,747	$2,516,604
Geophysical Work		
Airborne geophysics line-km	347,390	4,807
Airborne geophysics expenditures	$3,451,815	$120,103
Ground Geophysics line-km	579	477
Ground Geophysics expenditures	$504,820	$306,206
Drilling		
Metres drilled	8,397	1,127
Number of drill holes	134	11
Drilling expenditures	$1,646,934	$416,667

In addition, the retirement of a significant number of AGS staff during the next decade will make their knowledge of archived information and data less accessible, the result being a decrease in the usefulness of existing data and information. To retain this information and continue to make it available to the public, government agencies and industry, the AGS needed to inventory and organize its historical data and information holdings. Moreover, as the demand for digital products increases with technological advances, the AGS wanted to make data and information, including historical sources, increasingly available in digital form to its stakeholders.

To date, AGS staff have reviewed 3324 hardcopy items in storage on-site at AGS offices, assigned to each a geographic frame of reference and keywords, and made recommendations regarding disposition (retain or discard). As a result, 1894 items were retained and 1430 items were recommended for disposal following appropriate procedures.

The retained items were divided into three broad categories and documented in a Web-based catalogue:

- ✔ **Energy:** Oil and Gas, Oilsands, Coal, Coal-bed Methane, Basin and Hydrogeology
- ✔ **Minerals:** Industrial, Metallic, Sand and Gravel, Quaternary, Precambrian
- ✔ **Support:** Administration, Information Technology, Library, Publications

Metallic, Non-metallic and Industrial Mineral Assessment and Activities

During 2000 approximately 2.3 million hectares were staked in Alberta, and to the end of December 2001 an additional 4.1 million hectares (473 permits) were applied for. In 2000 about $17.3 million dollars were filed for assessment, whereas to end December 2001 there has been a significant decrease to only $2.5 million dollars. Most of the exploration during 2000 and 2001 was directed towards diamondiferous kimberlites, with lesser amounts directed to exploration for precious-base metal deposits in northern Alberta, uranium in the Athabasca Basin in northeast Alberta and iron or other mineral commodities elsewhere in the province.

To the end of 2001, a total of 46 kimberlites have been discovered in Alberta, including: 2 at Mountain Lake south of Peace River, 36 at Buffalo Head Hills in north-central Alberta, and 8 at the Legend area in the Birch Mountains in northeastern Alberta.

Alberta has a long history of industrial mineral production, with the production and dollar value being on a slight increasing trend over the past few years. At present, the main production is from limestone for cement and lime, with some production of clay, dimension stone and a few other commodities. An important change in limestone production has been the conversion from natural gas fired kilns to coal fired kilns. For example, Graymont's Exshaw plant near Canmore is already converted to coal, and both Inland and Lafarge are in an engineering phase to convert their operations to coal fired as well.

In recognition of the importance of the energy and mineral sectors to the provincial economy, the Government of Saskatchewan increased funding for the Saskatchewan Geological Survey by $920 000 in 2001-2002 to almost $3.3 million including professional and support staff salaries, summer student hiring, and operational expenditures. Of the increased funding, $420 000 will be used for minerals-related geoscience by the Northern Geological Survey Branch and $500 000 for petroleum- related research by the Petroleum Geology Branch. Several new professional staff are being hired and new research projects initiated. Most research is undertaken in partnership with the Geological Survey of Canada, various universities, industry and, in some cases, other provincial government departments.

Precambrian Geology and Mineral Deposits

Four major projects begun in 2000 continued; all are in partnership with the Geological Survey of Canada:

- ✔ The EXTECH IV – Athabasca Uranium Study is a collaborative 3-year investigation of the Athabasca Basin and its uranium deposits. Other funding partners are Cameco Corporation, COGEMA Resources Inc. and the Alberta Geological Survey (AGS). The project team includes more than 50 geoscientists from the government and industry partners, the Saskatchewan Research Council, the University of Regina (U of R), University of Saskatchewan (U of S) and Laurentian University (LU). There are two main objectives to this investigation: 1) to improve understanding of the Athabasca Basin and the context of its uranium deposits; 2) to develop new technologies for exploring for uranium, particularly in the deeper part of the basin. Highlights during 2001 include the completion of a high resolution seismic survey in the vicinity of the McArthur River Mine, additional borehole geophysical logging, continued work on the origins and roles of organic matter and hydrocarbons associated with uranium mineralization; refinement of the stratigraphy of the Athabasca Group and a detailed study of the structural context of uranium mineralization in the Sue C orebody at Cluff Lake.
- ✔ The Uranium City Area Mapping Project is a an initiative to better understand the geology of the Uranium City area and its influence on a number of mineral occurrences including uranium, gold, base metal (copper and zinc), platinum group metals (PGM) and Rare Earth Elements (REE). Work in 2001 entailed additional geological mapping to the west of the Black Bay Fault.
- ✔ The Phelps Lake project is being undertaken in order to identify mineral development opportunities and to provide background geoscience information to help in the selection of the boundaries of a large Representative Areas Network site (park) proposed for the Phelps Lake map sheet (NTS 64M). In 2001, a large field crew completed 1:100 000-scale bedrock and surficial mapping of the northwest quarter of NTS map-sheet 64M. The project also included a study of the nature and context of mineral occurrences both within the mapped area and throughout 64M.
- ✔ The Flin Flon VMS Project, which also includes the Manitoba Geological Survey and Laurentian University, is an investigation of the context of and alteration process associated with the Flin Flon VMS deposits. Several components of this study are underway. A companion investigation involves a detailed examination of the structural context of the Konuto Lake mine.

Industrial Minerals

The new "Diamondiferous Kimberlites of Central Saskatchewan" project is a two year multi-disciplinary federal-provincial-industry-university project designed to facilitate and promote further diamond exploration in central Saskatchewan. This comprises a number of subprojects including detailed stratigraphic, biostratigraphic, volcanologic and petrologic

studies to establish a regional architectural framework for the kimberlites. Additionally, detailed investigations, including shallow 2D and 3D seismic studies and borehole geophysics, will be undertaken on selected kimberlite bodies to determine their internal structure, emplacement, post-emplacement histories, and controls on diamond grade.

Investigation of sodium sulphate deposits continued in the 2001 field season. The main focus was a detailed study of the lacustrine deposit at Lydden Lake, one of the province's larger unmined sodium sulphate deposits. A preliminary analyses of the solute mass balance for the lake suggests that most of Lydden Lake's Sr budget (a proxy for all solutes) is derived from deeper, regional flow cells rather than shallow, locally derived groundwater. Collection of brine chemistry data from oil well samples continued.

Petroleum Geology

The $500 000 increase for petroleum geoscience brings the budget for southern geoscience to over $850 000, enabling the Petroleum Geology Branch (PGB) to more than double its geoscience research and support staff, b) renovate the Subsurface Geological Laboratory to accommodate additional staff, and c) support university geoscience research programs in the Phanerozoic subsurface. Recruiting is expected to be completed early in 2002. Five and ten-year research programs are in development, with industry-needs a prime consideration. To this end, a Technical Advisory Committee, currently made up of three industry geoscientists, one representative each from of the geology departments of the University of Saskatchewan and the Uiversity of Regina, and the directors of GSC Calgary and PGB has been established to provide guidance and monitor progress. Also, two day-long "industry geoscience needs" forums in Regina and Calgary have provided information that will be used in program development.

The Western Canada Sedimentary Basin Committee, convened in 2000 to help exchange details about, and co-ordinate as appropriate, the geoscience research programs of provinces and the GSC in this economically significant area of Canada, held its second meeting in Regina. Action items identified were: 1) coal-bed methane research; 2) tectonic history of Western Canada Sedimentary Basin, with input from, *e.g.*, Alberta, Manitoba, British Columbia, Saskatchewan; 3) development of a communication strategy that would invite the federal government to invest in the Co-operative Mapping Strategies as they relate to the WCSB; and 4) data integration through the Canadian Geoscience Knowledge Network. These items will also be considered during Saskatchewan's southern geoscience research program development.

The Geoscience Framework component of the International Energy Agency Weyburn CO_2 Monitoring and Storage Project began in earnest during the latter half of 2001. The PGB is responsible for mapping and interpretation of pre-Mississippian strata (with emphasis on deposition and dissolution of evaporites) in an area that extends 100 kilometres east, north and west from the Weyburn Pool and to the U.S. border to the south. It will also undertake preliminary regional mapping of Mississippian and post-Mississippian strata in the same area and determine the influence of the geological evolution of pre-Mississippian strata on the sedimentology, diagenesis, porosity and permeability of Mississippian reservoirs. PGB will also take a lead role in ongoing, practical co-ordination of all the geoscience framework studies. These studies include hydrogeology (University of Alberta, Saskatchewan Research Council, Mollard and Associates), reflection seismic (U of S), detailed geology of Mississippian and post-Mississippian strata (U of R), remote imagery analysis (Mollard and Associates) and extension of regional mapping into northwestern North Dakota and northeastern Montana (North Dakota Geological Survey). Towards the end of the project (in 2003-2004), PGB will organize the integration and analysis of all available geoscience data sets regarding tectonics, sedimentation, diagenesis and fluid flow in order to establish a comprehensive geological framework to help identify controls on CO_2 migration and storage in the wider Weyburn area. This in turn will be used by other project participants to assess the potential of carbonate strata for storage of CO_2 in Saskatchewan and globally.

In 2001, other projects have focused on a) Cretaceous Colorado Group rocks (with USGS),

b) Paleozoic strata, in particular of Devonian age, c) production of annotated digital and hard-copy 1:2 000 000-scale structure and isopach maps of the province's main Phanerozoic stratigraphic units, d) preparing Dr. Jim Christopher's Mannville Report for release in digital format, and e) updating the Saskatchewan Stratigraphic Correlation Chart in a digital format. The Lower Paleozoic Map Series will be completed by the end of the year, and work is well underway on the Devonian Map Series with preparation of standard cross-sections and systematic re-picking of all wells. Joint studies with the Geological Survey of Canada, United States Geological Survey, and the Geoscience Departments of Universities of Alberta, Regina, and Saskatchewan are productive. Summaries of many of these and geoscientific research projects carried out in the province by researchers from other institutions were published in volume one of the two-volume *Saskatchewan Geological Survey Summary of Investigations*, which was released at the Ninth Williston Basin Horizontal Well and Petroleum Conference in Regina at the end of April.

The number of oil and gas wells drilled in the province in 2001 is expected to be slightly fewer than the 3605 wells drilled in 2000, though a new record for gas wells (approximately 1300) is assured. Extra staff members have been working to process the resultant large volume of well data and keep the backlog to a minimum. Use of the Subsurface Geological Laboratory for core and sample examination has been modest but generally steady.

Computerization

Digital product and processing capability continues to develop not only in the Saskatchewan Geological Survey but also throughout the Saskatchewan Department of Energy and Mines (SEM). GIS software is being used to aid in map production and geological interpretation. The summer of 2001 was the first during which hand-held Personal Digital Assistants (PDAs) were used in a Precambrian mapping project for entering geological data on the outcrop. The data were downloaded each evening and incorporated into a Microsoft Access database and ArcView project for up-to-date map display. PDAs were also used to enter core logging data as part of one of the EXTECH IV projects. All current Precambrian geology maps included with the Summary of Investigations are produced using either ArcView and Microsoft Access or AutoCAD and FieldLog on digital bases provided by Information Services Corporation (ISC). The maps and associated data files are available digitally. The Geological Atlas of Saskatchewan CD-ROM version 4 (2001), released at the 2001 Open House Meeting in late November, includes new datasets as well as updates and enhancements of datasets included on previous releases. The 1:250 000-scale Compilation Bedrock Geology Map Series is in the process of being digitized, edge-matched and updated with an estimated time for completion by the end of 2002. Mineral disposition maps have been converted to digital format and are available. Assessment work area maps and mineral deposit information are available digitally.

The Saskatchewan Geological Survey is represented on the Canadian Geoscience Knowledge Network (CGKN) Implementation Committee whose purpose is to investigate and develop methods to establish computerized links to all government geological surveys in Canada and provide national and international access to Canadian geoscience knowledge. The first step in this process, the preparation of a CGKN Online Geoscience Catalog which will allow textual and graphical searches of available publications, is in progress.

The internet site for the department, **www.gov.sk.ca/enermine,** will continue to see the addition of information items. An internet based compiled database of kimberlite indicator mineral surveys is available for searching and download. Mineral disposition maps are available for viewing on the internet. Selected layers from the Geological Atlas of Saskatchewan will be made available on the internet with a target date of early 2002.

Mineral Resource Assessments

Regional mineral resource assessments (MRAs), of known and potential mineral and petroleum resources, are being done in response to Saskatchewan's Representative Areas Network program to preserve areas of ecological diversity, and regional integrated land use planning processes. They also provide

Table 1 - Saskatchewan Exploration Expenditures 1997-2001

(in millions of dollars)

	1997	1998	1999	2000	2001(e)
Uranium	27.32	22.40	14.00	17.74	14.19
Gold	3.50	2.76	0.95	0.73	0.92
Base Metals	10.11	3.68	5.64	4.47	2.43
Diamonds	2.30	1.01	1.43	4.11	8.56
PGM[1]			0.91	1.02	1.23
Other	0.15	0.21	0.81	0.14	1.90
Totals	**43.38**	**30.06**	**23.74**	**28.21**	**29.23**

Source: Resident Geologists' Survey, Saskatchewan Energy and Mines

1. Exploration for platinum group metals (PGM) was not reported separately prior to 1999

(e) = Estimated

a source of information for industry clients. Appraisals at a scale of 1:250 000 have been completed for the northern portion of the province and for most areas in the south. MRAs have been completed in the last year for NTS map sheets 62E-F, 62L-K, 72H, 72K, 72N, 73C, 73F, 73K, and 73N. In addition map sheets 72F, 72G, and 74C were updated. MRA coverage for the entire province should be completed next year. Developed by the Ontario Geological Survey, the mineral assessment methodology is qualitative and integrates, through a structured process, geoscience and mineral and petroleum exploration and development data with assessment criteria derived from descriptive mineral deposit models. Participation of the mineral and petroleum industries is a critical component of the process. Digital geological compilation and mineral and petroleum resource assessment maps in AutoCad are the main products of the assessments. These are being upgraded to an ArcView GIS format over time.

Exploration And Development

Minerals

The annual survey of mineral exploration expenditures carried out by the resident geologists indicated that mineral exploration expenditures in 2000 were about $28.2 million, an increase of $4.5 million over 1999 (*see* Table 1). Exploration expenditures rose for uranium and diamonds, decreased for base metals and remained low for gold. In 2001, total exploration expenditures are forecast to rise slightly to about $29.2 million. These estimates indicate that diamond exploration will more than double to $8.6 million, with activity in most other sectors decreasing, although there is new interest in REE and tantalum potential. At the close of calendar 2001, 3463 dispositions covering 2.5 million hectares (ha) were under disposition for metallic minerals. This compares with 2.3 million hectares at the end of 2000, 2.7 million hectares at the end of 1999 and 3.3 million hectares at the end of 1998.

Over a dozen companies, acting either independently or in joint ventures, are undertaking uranium exploration in the Athabasca Basin. In 2001, uranium exploration expenditures are forecast to decline to about $14.2 million from $17.74 million in 2000. This decrease reflects weak prices which have only recently begun a modest recovery. The all-time low spot price of US$7.10/lb U_3O_8 in late 2000 had risen to US$9.60/ lb U_3O_8 by December 2001.

In 2000, Saskatchewan continued to be the world's leading miner of uranium, accounting for 31 percent of global mine production. Total Saskatchewan production was 10 732 tonnes uranium, up 30 percent from the 1999 total of 8214 tonnes. This increase was largely due to ore from the new McClean Lake and McArthur River mines. Originally scheduled to end in 2000, operations at Cluff Lake (100% COGEMA Resources Inc.) have been extended into 2002 due to higher ore grades, available capacity in the tailings management area, lower production costs and improved productivity.

Saskatchewan's gold and base metal production, though small, remained steady. By mid 2001, Claude Resources Seabee Mine had achieved lifetime production of 500 000 ounces gold despite lower than expected grades during the early part of the year. Hudson Bay Mining and Smelting Company's (HBM & S) Konuto Lake Mine had limited base metal production after a closure for part of 2001; limited production was also achieved from the Saskatchewan part of HBM & S's Callinan Mine.

In addition to Claude Resources, which explored in the vicinity of the Seabee Mine, Masuparia Gold Corporation completed a 12-hole 1000 metre diamond drill program on the Greywacke property in the La Ronge Domain. A possible reserve of 297 555 tonnes grading 9.26 g/t (0.27 oz/ton) gold is outlined.

Exploration programs for VMS-type Cu-Zn deposits continued along the southern edge of the shield and beneath the adjacent Phanerozoic cover at Amisk Lake (Hudson Bay Exploration and Development), Bigstone Lake (Aur Resources Inc.); Scimitar, Pistol and Red Hill lakes (Leader Mining International Inc.) and Wapawekka Lake (Golconda Resources Ltd.).

Exploration for platinum group metals (PGM), REE and specialty metals is active, but generally at a low level although some recent encouraging developments have been reported. BHP Minerals has entered into an option agreement with Uravan Minerals Inc., to earn a 70 percent interest in the area around the Rottenstone Mine, a Cu-Ni-Au-PGM past producer. Golconda Resources Ltd. holds 56 000 hectares of the Peter Lake Domain lower gabbroic sequence where past exploration located Pt-Pd-Cu-Ni occurrences. Great Western Gold Corp., has identified 24 REE occurrences along a regional fault system in their 6475 hectare Hoidas Lake property. Diamond drill core from their February 2001 program contained grades of up to 4.41 percent total REE oxides over 6.9 metres. Also, north of Lake Athabasca a Leader Mining International Inc.-Buhlman and Associates' joint venture is investigating Cs-Rb-Li-Ta-Sn lake and stream sediment anomalies in the Marchant Lake area.

In 2001 diamond exploration expenditures are forecast to be $8.6 million, double that spent in 2000. Most of this will be spent 60 kilometres east of Prince Albert in the Fort-à-la-Corne area where 70 kimberlite bodies have been identified. Recent positive results from exploration programs and increased understanding of the geological setting of the kimberlite bodies, coupled with a very favourable regulatory regime, have rejuvenated interest in the area. Land under disposition for diamond exploration has more than doubled over the last year to approximately 574 000 hectares.

On the Fort a la Corne Joint Venture, encouraged by the results from the 2000 program and to improve confidence limits on diamond value estimates, the joint venture partners (De Beers Canada Exploration Inc. - 42.25%; Kensington Resources Ltd. - 42.25%; Cameco Corporation 5.5%; UEM Inc. 10%) approved a $4.79 million, two phase 2001 exploration program which recovered up to 80 additional carats from Kimberlite 141, one of the higher priority bodies. The first phase of drilling involved the completion of 16 NQ core holes, totaling 4292 metres, on kimberlites 141, 140 and 150. Subsequently, nine large diameter (609 mm) reverse circulation drill holes in body 141 yielded 413.1 tonnes of kimberlite, and one hole in body 150 yielded 58.0 tonnes of kimberlite. Diamond recovery results were expected in January 2002.

Shore Gold's Star Kimberlite at the southeast end of the main Fort a la Corne trend, comprises an estimated 500 million tonnes of diatreme and pyroclastic crater-facies kimberlite. Starting in late 2000, a two-phase diamond drill program was undertaken to better define the limits and geological characteristics of the kimberlite. Hole Star 20 intersected 539.4 metres of mostly diatreme facies kimberlite before drilling was stopped at 627 metres. A 626 kilogram sample of split kimberlite core, taken over a continuous interval of 311.6 metres from a depth of 87.6 to 399.2 metres below surface, averaged 61 cpht and included higher grade intersections of 25.6 metres grading 435 cpht and 133 metres grading 116 cpht. Aggregate results from the 2000-2001 diamond drilling programs yielded 782 diamonds from 3422 kilograms of kimberlite, giving a projected grade of 36.3 cpht. In October 2001, in preparation for the extraction of a major bulk sample from the Star Kimberlite, Shore Gold recovered a sample of approximately 90

tonnes of wet kimberlite chips using a large diameter (609 mm), reverse circulation drill.

Saskatchewan supplies approximately one-third of the world's demand for potash. Eight conventional mines and two solution mines produced a near-record of more than 14 million metric tonnes of potash (KCl) in 2000, valued at over CDN $1.7 billion. Saskatchewan is also one of the world's leading producers of sodium sulphate and Canada's sole producer of bentonite. The production value of these two commodities, along with salt, other clays, silica sand, aggregate and thermal coal, totalled some $200 million in 2001.

Petroleum

In 2001, petroleum exploration and development expenditures in Saskatchewan are projected to total around $1.4 billion and jobs generated by the petroleum industry are estimated to reach close to 23 000 (direct and indirect). For the third consecutive year, the provincial natural gas drilling record has been broken. By the end of October this year, approximately 1300 new gas wells were drilled, surpassing the record of 1209 gas wells drilled in 2000. Total oil and gas drilling is forecast to be between 3300 and 3400 wells in 2001 which will be slightly down from 2000 (3605 wells drilled). During fiscal 2000/2001, the province received approximately $1.04 billion dollars in revenue (Crown royalties, freehold production taxes, mineral rights sales and miscellaneous) from the oil and gas industry. However, with the decline of crude oil and natural gas prices, revenues from Saskatchewan's hydrocarbon resource industry is forecast to be significantly lower in fiscal year 2001/2002, for which budgeted oil and gas revenues were $679.4 million.

Oil exploration throughout the province has been minimal, and no new discoveries have been reported. Most drilling activity has been developmental. Horizontal drilling exceeds vertical in southeastern Saskatchewan (ratio about 2:1) but in the other three petroleum and natural gas production and disposition areas of the province (centred on Lloydminster, Kindersley and Swift Current), vertical drilling is vastly predominant (horizontal to vertical ratios between 1:17 and 1:27).

Although the Weyburn Unit CO_2 miscible flood project encountered some start-up problems mainly related to CO_2 injection, it is now proceeding at full capacity.

Due to these delays, as of mid-September, cumulative CO_2 injection was 527 million cubic metres (18.6 billion cubic feet), about half that expected. Breakthrough had then been achieved at ten wells, and had resulted in an incremental increase in oil production of 250 m^3/day, which Pan Canadian considered to be encouraging. CO_2 reinjection had not then started.

High natural gas prices have again driven the development of natural gas resources in western Saskatchewan. Activity has continued to focus mostly on the drilling of infill wells in the Bigstick and Hatton pools, and of development wells in the Cadillac area south of the Wymark pool. A new discovery has been made along the border with Montana where, south of Senate, repeat sections of the Medicine Hat Sand and Milk River Formation are both productive (the repetition is likely the result of gravity slides off the northern flank of the Bears Paw Mountains). Also of potential economic significance is a gas discovery in Twp 29 Rge 11W2 area (south of Foam Lake) where several wells have been cased and applications made for gas testing in Upper Cretaceous strata (possibly Belly River Formation equivalents).

Activity is developing in two areas of commercial interest: coal bed methane and oil shale. The department has received numerous enquires about the potential for coal bed methane, and several postings in the February 2002 sale are likely to be related entirely to this product. As regards oil shale, about 400 000 hectares in east-central Saskatchewan have been acquired by three companies. Exploratory drilling is expected early in 2002 at about one well per township. The Second White Specks Formation will be cored to assay its oil content.

Manitoba Program Highlights 2001

Geoscience Program

In 2001, the geological program in Manitoba continued to focus on fostering a positive business climate for investment in mining and exploration within the province. This year, approximately 31% of the Manitoba Geological Survey (MGS) project-related operating budget was directed toward studies in the northern Superior Province, primarily for programs in support of diamond-related exploration. Approximately 48% of the project-related operating budget was directed toward projects within traditional mining camps: Flin Flon Belt, Lynn Lake Belt, Thompson Nickel Belt and southeastern Manitoba. The remaining 21% supported Quaternary, aggregate, industrial minerals and land-use planning in the south-central part of the province, as well as province-wide projects.

Geoscience activities in Manitoba this year reflect the completion of some major projects (*e.g.*, Thompson Nickel Belt CAMIRO), the final year of other collaborative ventures (*e.g.*, Western Superior and Winnipeg Region NATMAPs) and the start of new projects (*e.g.*, Targeted Geoscience Initiative (TGI) projects in the Lynn Lake–Leaf Rapids and Flin Flon regions).

The program is reviewed annually by the Mineral Exploration Liaison Committee (MELC), composed of members of the Mining Association of Manitoba, the Manitoba Prospectors and Developers Association and the Manitoba–Saskatchewan Prospectors and Developers Association, as well as representatives from the University of Manitoba and the Geological Survey of Canada (GSC).

Partnerships, or collaborative projects with external agencies and organizations, form an increasing proportion of the MGS geoscience program. Such partnerships make best use of combined funds and expertise, and result in high-quality, focussed, effective programs. The partnered initiatives include contributions from the federal government, the mineral-exploration industry and several Canadian universities. These partnerships are expected to add approximately $1.9 million to the geoscience program in Manitoba for 2001–2002, providing significant leverage to the MGS geoscience budget.

Federal-provincial cooperation and coordination of geoscience projects continued with the Government of Canada's $15 million, three-year Targeted Geoscience Initiative. The GSC is involved in two projects located in Manitoba and adjoining portions of Saskatchewan. Funding from GSC through the TGI is matched by funding and in-kind contributions by MGS. The mapping projects will significantly increase understanding of the geology and mineral deposits in Lynn Lake–Leaf Rapids and Flin Flon regions, where there is significant potential for the discovery of new base and precious-metal deposits.

Precambrian Mapping

Regional mapping projects were conducted in the Superior Province, Thompson Nickel Belt, Superior Boundary Zone, and Flin Flon–Lynn Lake–Leaf Rapids portions of the Trans-Hudson Orogen.

In the Superior Province, the Western Superior NATMAP project is focused on defining the crustal evolution and tectonic assembly of the Superior craton west of Lake Nipissing. New 1:250 000-scale bedrock geology compilation maps will be produced in 2001–2002 as contributions to the project, which has entered its last operating year. Regional mapping conducted under the auspices of the Western Superior NATMAP was limited in 2001, with emphasis placed instead on evaluation and consolidation of data collected during the project.

Two thesis projects were sponsored by MGS in the Superior Province this year: an M.Sc. tectonostratigraphic and geochronological study at Waterloo University in the Island Lake greenstone belt, and a Ph.D. structural study at the University of Maryland, which will contribute to the growing understanding of Archean tectonics in the northern Superior.

The MGS and industry partners Inco Ltd., Falconbridge Ltd., and Hudson Bay Exploration and Development Co., Ltd. have been involved in a multi-year collaborative program designed to create a new compilation map of the Thompson Nickel Belt (TNB). A preliminary version, published in June 2001, includes a set of fifteen maps that cover an area from Moak Lake (northeast of Thompson) to Bracken Lake (north of Grand Rapids).

A new project was started to document the geological relations and isotopic ages of rocks north of Thompson, along the complex boundary zone between the northwestern Superior craton and the Trans-Hudson Orogen. In 2001, work proceeded on a 60-kilometre transect from Thompson to Pearson Lake. Samples were collected for a variety of studies, including Nd-Sm isotope systematics and U-Pb age determinations, to be conducted at the University of Alberta.

In the Trans-Hudson Orogen, regional mapping was conducted in the Wabishkok Lake area near Flin Flon, a lithologically and structurally complex area that has not been mapped since the 1950s. The GSC began its first field season of a TGI project aimed at providing a regional tectonostratigraphic context for supracrustal and plutonic rocks along a transect extending northeast from Leaf Rapids. The 2001 field program included a re-evaluation of the lithotectonic framework from the northwestern margin of the Rusty Lake belt to the Partridge Lake belt, as well as a companion study on the mineral potential of the Rusty Lake belt.

Mineral Deposits Investigations

Many of the MGS mineral deposits investigations in 2001 were conducted in conjunction with partnership programs such as CAMIRO and TGI.

The four-year Canadian Mining Industry Research Organization (CAMIRO) project in the Thompson Nickel Belt was completed in 2001. The project has five industry sponsors (Inco Ltd., Falconbridge Ltd., Hudson Bay Exploration and Development Co., Ltd., Billiton Metals Canada Inc. and Western Mining International Ltd.) and a combined industry–NSERC budget of approximately $800 000. Researchers from Laurentian University, the University of Manitoba, Université de Québec à Montréal, University of Alberta, University of Saskatchewan, MGS and GSC conducted geochemical, geochronological and structural studies in the TNB that have contributed fundamental new information for this world-class nickel district. The Thompson Nickel Belt CAMIRO project wrapped up with a sponsors' meeting and field trip in August 2001.

Nine new projects have been initiated under the Flin Flon TGI. These projects are designed to increase understanding of the volcanic and hydrothermal events influencing the setting of volcanogenic massive sulphide (VMS) deposits in the central Flin Flon Belt. This study brings together geoscientists from the GSC, MGS, Saskatchewan Geological Survey (SGS), Laurentian University and the University of Manitoba to collaborate with local exploration geologists from Hudson Bay Exploration and Development Co., Ltd., Aur Resources Inc. and M'Ore Resources. The Flin Flon TGI involves separate but integrated subprojects spanning the Manitoba–Saskatchewan border, including alteration-related studies, trace-element geochemistry of VMS deposits, a cross-border geological compilation of the Flin Flon area, and a facies study of the volcaniclastic host rocks to the Flin Flon, Triple 7 and Callinan deposits.

The MGS began an integrated study to better understand the gold and base-metal potential of the Lynn Lake Belt in 1999, with deposit-scale studies, structural mapping of mineralized shear zones and targeted geochemical surveys to aid mineral exploration. In 2001, these activities were bundled into the new Lynn Lake–Leaf Rapids TGI project. Component projects include 1) a structural, stratigraphic, mineralogical and geochemical investigation of the Agassiz Metallotect (Ph.D., University of New Brunswick), 2) a structural, mineralogical and geochemical investigation into the genesis of gold mineralization associated with the Johnson Shear Zone (M.Sc., Laurentian University), 3) development of a digital "expert system" utilizing existing and new digital data sets in the Lynn Lake area to develop a predictive tool for gold exploration (M.Sc., University of Manitoba), and 4) regional structural studies in the Lynn Lake Belt.

The MGS conducted studies supportive of platinum group element (PGE) exploration in a number of localities, including the Bird River sill in southeast Manitoba and at the recently discovered McBratney Lake PGE occurrence east of Flin Flon. The latter occurrence highlights the mineral potential for 'contact-type' PGE mineralization associated with the physical and chemical interaction between a gabbroic magma and sulphide-bearing mafic volcanogenic host rocks. The McBratney Lake PGE discovery is significant because of the exceptionally high PGE tenor and significant potential for similar mineralization at gabbro-basalt contacts in the region.

Geochemical Surveys

Manitoba's five-year 'Operation Superior' multimedia geochemical survey began in 1995 and completed its final year of data collection in 2000, but the program's success led to a continuation of the survey in the northern Knee Lake region in 2001. Helicopter-supported, multimedia geochemical and indicator mineral surveys were targeted on greenstone belts throughout the northern Superior Province during Operation Superior. Published results from 'Operation Superior' are credited with helping to spark the recent rush in diamond exploration in the region, where approximately 24 000 square kilometres have been taken out in exploration permits and claims.

In 2001, rock, till, b-horizon soil, humus and vegetation samples were collected for multi-element geochemical analysis from 157 sites in an area west, north and east of the northern half of the Knee Lake greenstone belt. The sampling included 150 bulk till and beach sand samples collected for kimberlite indicator-mineral identification and analysis.

Phanerozoic Investigations

Stratigraphic investigations and drilling programs were carried out for various projects in south and south-central Manitoba. The Manitoba Stratigraphic Database (MSD) continues to be updated, now containing information for 5619 stratigraphic, mineral-exploration, oil-and-gas and other wells, of which 4340 have formation tops.

The Capital Region Study involves an investigation of the crushed-stone and mineral potential in and around the City of Winnipeg. Preliminary maps for the northern portion of the Capital Region Study were released in printed form in 1999 and will be useful for land-use planning in surrounding municipalities.

The mineral potential of Phanerozoic rocks and underlying Precambrian basement is an important area of study in south-central Manitoba. This year, a gravity and magnetic survey along The Pas Moraine was conducted to investigate the gravity and magnetic field of the Superior Boundary Zone and further define the southern extension of the Thompson Nickel Belt.

Surficial Geology

A new project was undertaken this year to outline the Quaternary stratigraphy and determine the provenance of tills in the northern Superior Province and adjacent Hudson Bay Lowland, in support of diamond exploration. Investigations of seven river-cut till sections northeast of Knee Lake include a combination of pebble analysis, carbonate analysis, matrix geochemistry, textural analysis, kimberlite indicator-mineral analysis and pebble-fabric analysis.

In addition to the multimedia and diamond-indicator studies in the northern Superior Province, two Quaternary research topics are being investigated in Manitoba. The first project is studying the influence of recent geological and climatological processes on flood frequency in the Red River Valley, while the second deals with the compilation of digital data sets in support of a three-dimensional (3-D) digital geological model for southern Manitoba. Both projects represent collaborative efforts with the GSC.

Research on the long-term sustainability of the fresh groundwater resource in southern and central Manitoba is addressing the protection of recharge and ensuring that extraction does not lead to unacceptable lateral migration of saline waters. Three-dimensional (3-D) modelling for the Phanerozoic terrane of southern Manitoba is an important element of this strategy, with applications ranging from basic science to groundwater-flow modelling and live-

stock management. The Phanerozoic sequence, comprising Quaternary sediments and Phanerozoic sedimentary rocks, down to and including the Precambrian surface, will be modelled in a GIS environment using all readily available, nonconfidential, drillhole databases.

Industrial Minerals and Aggregate Investigations

Aggregate-resource inventories are being updated for a number of rural municipalities in southern Manitoba, including the Capital Region area, where the long-term objective is to update 1:100 000 scale aggregate resource maps. In 2001, assessment of aggregate resources was also carried out in a number of candidate sites proposed under the Protected Areas Initiative.

Land Use

The MGS conducts a number of activities related to sound land-use management: 1) provision of mineral-resource assessments in candidate sites under the Protected Areas Initiative; 2) identification of potential geological hazards (*e.g.*, shoreline erosion, neotectonics, landslides); 3) review of land-use planning submissions; 4) examination of applications for surface use of crown land to ensure that access to mineral occurrences is not adversely affected; and 5) collaborative programs with Manitoba Conservation, Manitoba Hydro and the GSC to evaluate geological hazards and potential impacts on development.

Geoscience Information Services Section

The Geoscience Information Services Section has worked extensively on digital conversion of both 1:250 000 bedrock and surficial geology maps, in preparation for delivery via the Internet map server on the departmental Web site. GIS and data-management support was also provided to the Western Superior NATMAP project and Flin Flon TGI. In November 2001, the GSC and MGS jointly released a comprehensive digital compilation of geological, geochemical and geophysical data sets for southeast Manitoba on CD-ROM.

The 'GIS Map Gallery' is the department's access point for information on mineral claims, assessment files, and geological databases. To access the database, clients use an Internet connection and a JAVA-enabled web browser such as Microsoft Internet Explorer™ or Netscape Navigator™. The web site has a user-friendly GIS interface, with tools that allow query and analysis of the most current data sets relevant to the mining and mineral exploration community.

Client Services

Client Services provides communications, outreach and information production and dissemination services for the Mineral Resources Division to assist in the promotion of exploration and mining investment opportunities and increase public awareness of the benefits and opportunities of sustainable mineral development. Client Services staff were responsible for the editing, desktop publishing, reproduction, promotion and distribution of MGS reports, maps and open files. These publications, as well as other minerals-related information resources, were disseminated through library services, publication sales and the Mineral Resources Division web site.

Regional Offices

Staff in regional offices in Flin Flon and Thompson respond to a range of inquiries, including regional geology, potential of mineral properties and mineral identifications. These offices also provide mining recording services to the communities, including recording new mineral claims, and maintaining an up-to-date library of provincial claim and land-status maps. They also provide access to, and sales of, maps and reports, and access to electronic databases.

Ontario Program Highlights 2001

Introduction

Core business:

The Ontario Geological Survey (OGS) is part of the Mines and Minerals Division, Ministry of Northern Development and Mines (MNDM). Geoscience activities of the OGS during 2001 focused primarily on the needs and priorities of the mineral industry to help foster a favourable business and investment climate in Ontario. During 2001, the geoscience core program expanded to include a public health and safety component. Initial emphasis under the health and safety initiative is ground-water aquifer mapping. Geoscientific results of ground-water mapping assist in protecting the public well-being, including health and property, and helps safeguard the environment, required to help foster sustainable economic development.

Administrative units:

The core OGS administrative units are: Precambrian Geoscience Section, Sedimentary Geoscience Section, Resident Geologist Program, the Geoscience Laboratory. Units of the Information and Marketing Services Section and the Business Solutions Services Section support the OGS geoscience program.

Operation Treasure Hunt:

Delivery of new geoscience data continued under Operation Treasure Hunt (OTH), a three-year, $29 million Ontario government geoscience initiative announced in March 1999. In 2001, the OTH geoscience projects included: airborne geophysical surveys, both new survey data and proprietary survey data; determination of physical rock properties; bedrock compilation at 1:250 000 scale; compilation of Platinum Group Element mineralization and related intrusions; compilation and understanding of fertile peraluminous granites and related rare-element pegmatite mineralization; development of thick overburden geochemistry methods; lake sediment surveys; indicator mineral surveys; surficial geoscience observations database; CLAIMaps project; and data management and product dissemination. OTH is generating new exploration targets, is stimulating mineral exploration in Ontario, and is attracting and retaining national and international mineral investment in Ontario. OTH terminates on March 31, 2002.

Ontario Mineral Exploration Technologies program:

While OTH focuses on the collection of new geoscience data, the Ontario Mineral Exploration Technologies (OMET) program builds on the existing geoscience data to research and apply new concepts, methods, and technologies to enhance mineral exploration in Ontario. Announced in September 2000, the OMET program is a four-year, $8-million initiative to develop and test innovative mineral exploration technologies and methods. The goal is to enhance the efficiency of exploration firms in high potential geological areas of Ontario. Laurentian University delivers OMET through an administrative agreement with the Ontario Government.

Budgets:

The 2000-2001 base budget for the geoscience activities of the Mines and Minerals Division (*see* budget table) was approximately $11,105,400. This budget covers salary and operational expenses for the geological mapping function, the Resident Geologist function, the Geoscience laboratory function, geoscience assessment function, the library function, the publication function and the data warehouse and distribution functions. The OTH budget was $9 million in 2000-2001. In 2000-2001, the OMET budget was $0.5 million.

We invite you to come and explore Ontario at: **www.mndm.gov.on.ca/MNDM/MINES/mmdhpge.htm**

Ontario Geoscience Activities – Highlights

Economic Activity - Significant Exploration Projects

Diamonds

- ✔ Victor Kimberlite Project, De Beers Canada Exploration Corporation.
- ✔ Gem Quality (GQ) Project, Band-Ore Resources Limited Festival Property, Pele Mountain Resources Inc.
- ✔ Whitefish Lake Project, Canabrava Diamond Corporation.

Gold

- ✔ Eagle River Mine Project, River Gold Mines Ltd.
- ✔ Red Lake Mine Project, Goldcorp Inc.
- ✔ Madsen Mine Project, Placer Dome (CLA) Ltd.
- ✔ Clavos Property, Kinross Gold Corporation.
- ✔ Red Lake Project, Rubicon Minerals Corporation and AngloGold North America.
- ✔ Kirkland Lake (Lebel) Project, Queenston Mining Inc. and Franco-Nevada Corporation Limited.

Platinum Group Elements

- ✔ Dana Lake and Lismer properties, River Valley Project, Pacific Northwest Capital Corp. and Anglo American Platinum Corporation.
- ✔ Agnew Lake Intrusion property, Ursa Major Minerals Corporation.
- ✔ River Valley Project, Mustang Minerals Corporation and Impala Platinum Holdings Limited.
- ✔ East Bull Lake Intrusion projects, Freewest Canada Inc. / Sparton Resources Inc and Aquiline Resources Inc.
- ✔ Marathon Palladium Project, Geomaque Explorations Ltd.

Petalite and Rare Metals

- ✔ Pakeagama Lake property, Houston Lake Mining Inc.
- ✔ Separation Rapids property, Champion Bear Resources Ltd.
- ✔ Separation Rapids Pegmatite Project, Emerald Fields Resources
- ✔ Big Mack Petalite property, AMZIM Minerals Ltd.
- ✔ Lilypad Lake Tantalum Project, Avalon Ventures Ltd. And Global Canada Company

Cobalt

- ✔ Werner Lake, Canmine Resources Ltd.

Nickel-Copper

- ✔ Nickel Rim (Sudbury) Project, Falconbridge Limited.
- ✔ Montcalm Nickel (Timmins) Project, Falconbridge Limited.
- ✔ Alexo Nickel Mine property, Hucamp Mines Ltd.
- ✔ Sudbury Basin Exploration, Inco Limited.

Vermiculite

- ✔ Cavendish and Galaway township properties, Regis Resources, Blue Marble Resources and J.C. Archibald.

Wollastonite

- ✔ St. Lawrence Wollastonite Project

Silica

- ✔ McClintock Township property, International Quartz Ltd.

Graphite

- ✔ Bedford Township property, Diamond Lake Minerals

New or Expanded Mine Operations

Gold

- ✔ Eagle River mine, River Gold Mines
- ✔ Red Lake mine, Goldcorp Inc.
- ✔ Palladium and Platinum
- ✔ Lac des Isles, North American Palladium

Zinc/Copper

- ✔ Kidd Creek, Falconbridge Ltd.

Geoscience Program Highlights

Precambrian Geoscience Section

In 2001, the Precambrian Geoscience Section (PGS) supported approximately 65 geoscience projects. These projects support a variety of initiatives that are subdivided into 5 broad categories outlined below.

1) Initiatives that involve collaborative project agreements with the Geological Survey of Canada included projects that supported Western Superior NATMAP and Lithoprobe; the Sudbury Targeted Geooscience Initiative (TGI); and the Far North Initiative.

2) Initiatives involving provincial-scale metallogenic compilation and inventory studies such as documentation of pegmatite-hosted rare-element mineralization; compilation of platinum-group element mineralization in mafic to ultramafic intrusions, in collaboration with Mineral Exploration Research Centre (Laurentian University) and Geological Survey of Canada; diamond assessment; inventories of various tectonic settings relevant to mineral exploration.

3) Initiatives based on geographic area such as the Abitibi initiative, Proterozoic initiative and the metallogeny of northwest Ontario which consist of core bedrock mapping projects and collaborative projects with industry and academia.

4) Initiatives involving program support practices such as digital data standards; support and program management practices; project and results management, including the documentation of geoscience program impact; and geophysics integration with bedrock mapping.

5) Initiatives based on add-on programs such as Operation Treasure Hunt (OTH) such as OTH airborne geophysics; OTH Physical rock properties; OTH Bedrock compilation maps; Phoenix-Beardmore Initiative, a community-supported bedrock mapping project funded by FEDNOR (Industry Canada).

6) A provincial bedrock compilation project in support of the Provincially Significant Mineral Potential initiative (*see* Resident Geologist Program description).

Sedimentary Geoscience Section

The activities of the Sedimentary Geoscience Section (SGS) in 2001 were focussed in the following fields:

Surficial Geochemistry – Four regional-scale lake sediment sampling projects, designed to assess mineral potential, were augmented by site specific applied research on exploration techniques in areas of thick drift in the Abitibi region. The study areas are primarily located within Archean greenstone belts.

Surficial mapping and sampling – A program to determine diamond and metallic/precious mineral potential was conducted in 4 areas of the province. A mix of traditional exploration and frontier areas, including the James Bay Lowland, were covered by the projects.

Industrial Mineral Assessments – Aggregate inventories, completed as part of an ongoing provincial program were undertaken in 2 areas to assist long-term resource use planning. Complementing these were Paleozoic bedrock aggregate and shale-quality investigations completed to meet pressing client/industry demands.

Groundwater Mapping – As part of a provincial strategy to assess and protect groundwater, SGS initiated a program with 3 components, including: creation of a seamless, GIS based surficial geology map for southern Ontario; development of a data model for groundwater related earth science data; and a pilot investigation to create a watershed scale 3-dimensinal materials/stratigraphic framework.

Linkages and Outreach – partnerships with industry, academia and various government agencies, are key elements in augmenting the program of SGS. These diverse projects included terrain evaluations, data compilation and mineral exploration methods development. In addition, SGS staff undertook or collaborated in a number of thematic studies and were called on to provide geological data and interpretations in support of land use issues being debated in the public domain.

Some of these projects were delivered as a core business function and some as part of Operation Treasure Hunt.

Resident Geologist Program

During 2001, staff of the Resident Geologist (RG) Program responded to approximately 34 000 in-office/ telephone client inquiries, conducted more than 400 client property and mine/ quarry visits/investigations, and provided 40 geological field trips to mineral industry clients and university students. Mineral exploration activity across the province focused primarily on diamonds and platinum group element (PGEs) mineralization, although industrial minerals and rare metal mineralization (REEs) also saw considerable attention. The monitoring of flow-though investment and activity impacts in Ontario has been initiated.

Program staff was also very active in land use planning and management activities, including the ongoing implementation of *Ontario's Living Legacy* (OLL) and the development of a new mineral resource assessment methodology known as Provincially Significant Mineral Potential (PSMP). As part of the OLL implementation strategy, the PSMP methodology is to be applied to the new protected sites in order to identify areas where controlled exploration will be allowed to occur.

The program continued to provide new information on its Internet website. Mineral exploration activity maps designed to accompany district monthly reports will be a new feature in 2002.

Information and Marketing Services Section

The Information and Marketing Services Section (I&MS) is responsible for marketing the geoscience, tax and infrastructure advantages of Ontario for investment attraction purposes. Marketing plans for 2001 include 16 trade shows, of which six are international and 10 are national events. I&MS also has the responsibility for maintaining the Geoscience Library services and the cartographic and hardcopy publication functions of the Mines and Minerals Division, through the Publication Services Section. Between September 2000 and August 2001, 240 maps, 44 reports, 23 digital information products and 26 digital data sets were released.

Business Solutions Services Section

Business Solutions Services Section assists the information gathering, access and distribution goals of the Mines and Minerals Division by providing the following services to the program areas: application business case development (feasibility studies), business process analysis and design, application system development and/or acquisition, application system implementations and application system support. With a focus on customer service, e-government initiatives and Land Resource Cluster activities and standards, Business Solutions provides leadership and expertise in GIS, database, computer application, system design and development and project management technologies and methodologies.

Geoscience Laboratories

During the fiscal year 2000 – 2001, the number of samples analyzed by the Geoscience Laboratories (Geo Labs) tripled primarily as a result of the Operation Treasure Hunt program.

Geo Labs focused on providing analytical and research services in geochemistry, mineralogy, reference material, and method development.

A Perkin-Elmer 6100 DRC ICP-MS unit was commissioned resulting in the Geo Labs producing high quality, research grade, multi-element ICP analyses.

A low-level PGE NiS fire-assay analytical procedure with an ICP-MS finish was developed for Au, Pt, Pd, Rh, Ru, and Ir. Researchers in Australia, Canada, France and South Africa have been extremely pleased with the results that have permitted them to discriminate between mineralized and unmineralized environments.

In early 2001, Geo Labs launched its first in-house reference material, OKUM (ultramafic komatiite) collected at Serpentine Mountain in McArthur Township, 25 kilometres south of Timmins. OKUM is characterized for majors

and 30 additional elements. Low-, medium-, and high-level PGE reference materials (LDI-1, LDI-2, and LDI-3, respectively) from the Lac des Iles gabbro complex northwest of Thunder Bay are currently in production, and will be available in 2002.

For a copy of the Geo Labs Schedule of Fees and Services or other information, contact the Geo Labs via e-mail at:
geoscience.labs@ndm.gov.on.ca

Le ministère des Ressources naturelles (MRN) appuie le développement économique durable des régions du Québec en favorisant la connaissance, la mise en valeur et l'utilisation optimale du territoire québécois et de ses ressources énergétiques, forestières et minérales.

Dans ce contexte, GÉOLOGIE QUÉBEC est l'unité administrative du MRN responsable de l'acquisition, du traitement et de la diffusion des connaissances géoscientifiques nécessaires à l'établissement et à la promotion du potentiel minéral du Québec, informations indispensables au bon fonctionnement de l'exploration minérale au Québec.

Géologie Québec réalise plusieurs projets allant du levé géologique de territoires nouveaux à la production de cartes d'évaluation du potentiel minéral, en passant par diverses compilations et le chargement du SIGÉOM (Système d'information géominière du Québec). Toutes ces informations sont rendues disponibles à la clientèle de l'exploration minérale sous forme numérique ou sous format papier. Géologie Québec appuie également l'industrie minière par l'entremise de plusieurs mesures d'assistance financière à l'exploration minière.

En 2001-2002, GÉOLOGIE QUÉBEC dispose d'un effectif de 197 personnes (dont 112 permanents) réparties à Charlesbourg et dans six bureaux régionaux (Montréal, Sainte-Anne-des-Monts, Sept-Îles, Rouyn-Noranda, Val-d'Or et Chibougamau).

L'adresse INTERNET de GÉOLOGIE QUÉBEC est:

www.geologie-quebec.gouv.qc.ca/

Le Service à la clientèle de l'exploration et du marketing (SCEM)

Le SCEM regroupe l'ensemble des services au comptoir offerts dans les six (6) bureaux régionaux (Montréal, Sept-Îles, Sainte-Anne-des-Monts, Rouyn-Noranda, Chibougamau, Val-d'Or). Le SCEM offre également, en collaboration avec le Secteur des forêts, des points d'accès à l'information géoscientifique à Sherbrooke et à Hull, en plus des services offerts au bureau de Charlesbourg. Chaque bureau régional est sous la responsabilité d'un géologue résident et fournit les services suivants:

- ✔ la communication de renseignements généraux sur la géologie, le potentiel minéral, l'industrie minière, les programmes d'aide financière et la Loi sur les mines;
- ✔ la consultation, la reproduction ou la vente de documents géoscientifiques;
- ✔ l'assistance technique aux utilisateurs du SIGÉOM;
- ✔ la vente et la mise à jour des cartes de titres miniers et le traitement partiel des dossiers relatifs aux titres miniers.

Le SCEM dispose d'une division du marketing qui s'occupe de la promotion du potentiel minéral québécois sur les scènes locales, nationales et internationales.

Le Service de la géoinformation (SG)

Le SG révise et prépare pour publication les nouveaux documents géoscientifiques (format papier et numérique) faisant état des résultats de travaux géologiques, géochimiques et géophysiques. Le SG compile et numérise les produits de compilation géoscientifique dans le SIGÉOM.

Les informations disponibles dans le SIGÉOM au début de l'année 2002 sont:

- ✔ la localisation des périmètres des travaux d'exploration provenant des rapports privés d'exploration minière (documents de la série GM) pour l'ensemble de la province;
- ✔ la localisation et la description de 5010 indices métalliques et 560 gîtes de minéraux industriels;

- ✔ la localisation et la description de plus de 121 600 forages au diamant de la province;
- ✔ 1475 cartes géologiques de terrain ou de compilation;
- ✔ les résultats d'analyses de sédiments meubles de la province;
- ✔ les produits géophysiques (champ magnétique total résiduel, gradient magnétique vertical, anomalies électromagnétiques);
- ✔ Les résultats d'analyses lithogéochimiques;
- ✔ la compilation des blocs erratiques.

Géologie Québec fournit à sa clientèle un accès Internet à sa base de données bibliographiques nommée «SIGÉOM-Examine». Quelque 70 000 références bibliographiques représentant le fonds documentaire géoscientifique de la province sont actuellement indexées dans cette base de données. Également, depuis novembre 2000, le SIGÉOM-à-la-carte, un moteur de recherche basé sur des éléments textuels, permet de consulter les données géoscientifiques et de les commander par l'entremise du commerce électronique.

Le Service géologique de Québec (SGQ)

Le Service géologique de Québec dessert un vaste territoire qui comprend les Appalaches, les Basses-Terres du Saint-Laurent, la majeure partie du Grenville et l'ensemble du territoire du Nouveau-Québec situé au nord du 55e parallèle. Une équipe d'une vingtaine de géologues répartis à Charlesbourg, Montréal, Sept-Îles et Sainte-Anne-des-Monts réalise les levés et les études géologiques.

En 2001-2002, le SGQ dispose d'un budget de 3,9 M$ pour réaliser 13 nouveaux projets. Encore une fois cette année, l'accent est mis sur la cartographie géologique. Ainsi, la plus grande partie des ressources sera consacrée à la réalisation de 5 projets qui généreront 5 nouvelles cartes géologiques: 1 feuillet au 1/20 000, 2 feuillets au 1/50 000 et 2 feuillets au 1/250 000.

Parmi les faits saillants, mentionnons la poursuite, dans le cadre du Programme d'exploration minière du Grand-Nord, de la cartographie géologique du territoire situé au nord du 55e parallèle (2 feuillets 1/250 000).

Ailleurs, les principaux travaux ont été réalisés dans la Province de Grenville, c'est-à-dire dans les régions de Mont-Laurier et du Lac Saint-Jean, ainsi que dans les Appalaches, soit en Estrie et en Gaspésie.

Le Service géologique du Nord-Ouest (SGNO)

Le Service géologique du Nord-Ouest dessert l'Abitibi, le secteur de la Baie-James et conjointement avec le SGQ, le Grand-Nord québécois. Son effectif est réparti dans trois bureaux régionaux situés à Rouyn-Noranda, Val-d'Or et Chibougamau. En 2001-2002, le SGNO dispose d'un budget de 3,1 M$ pour réaliser 4 projets de cartographie d'envergure et 5 études thématiques ainsi que des travaux de compilation géologique et gîtologique.

Deux projets de cartographie dans le Grand-Nord génèrent 2,5 nouvelles cartes géologiques au 1/250 000 et le programme d'exploration du Moyen-Nord permet de revoir la géologie de deux feuillets au 1/50 000. Les autres projets sont réalisés dans le cadre du plan triennal 2000-2003 de l'Abitibi. Ainsi, un projet d'inventaire géologique comportant un feuillet au 1/50 000 a été réalisé dans la sous-province d'Abitibi. Les études thématiques en cours impliquent des travaux de métallogénie, de géochimie, de volcanologie et de géologie structurale, en collaboration avec plusieurs partenaires universitaires et industriels. Les datations géochronologiques se poursuivent en Abitibi et dans les terrains du Nord.

En ce qui concerne l'évaluation du potentiel minéral, les travaux actuels en collaboration avec le SGQ et le SCEM visent à étendre les capacités du module SPCPM dans le SIGÉOM qui produira cette année dix cartes thématiques au 1/250 000

Le Service des minéraux industriels et de l'assistance à l'exploration (SMIAE)

Le SMIAE regroupe le personnel œuvrant dans les champs d'activité suivants: les minéraux industriels, la géochimie, la géophysique et les programmes d'assistance financière à l'exploration minière.

Le groupe des minéraux industriels réalise des études dans les domaines de la pierre de taille, des minéraux non métalliques, des granulats et de la tourbe (2 inventaires et trois études). Les responsables de la géochimie et de la géophysique compilent et traitent des données en appui aux travaux d'inventaire géologique effectués par les deux services géologiques.

Le groupe des programmes d'assistance financière a pour mandat de concevoir et d'administrer les programmes d'assistance financière à la prospection et à l'exploration minière. En 2001-2002, un budget de 12,9 M$ a été consacré à deux programmes:

- ✔ le Programme d'assistance à l'exploration minière du Québec dispose de crédits de 2,5 M$ pour les prospecteurs et les fonds d'exploration et de 5,4 M$ pour les entreprises.
- ✔ le Programme de soutien aux sociétés juniors d'exploration dispose de crédits de 5,0 M$, qui ont été alloués à seize entreprises.

Geological Surveys Branch

The Minerals and Energy Division of the Department of Natural Resources and Energy consists of three branches: Geological Surveys, Mines, and Energy Secretariat. The Geological Surveys Branch is responsible for building and maintaining a comprehensive geoscience database for the province and using it to assist mineral and hydrocarbon exploration and development as well as to advise the government and the public on issues such as land use, environment and construction. The branch has a staff of 28 and two regional offices – Bathurst and Sussex. The major activities of the branch are bedrock and surficial geological mapping; studies related to metallic minerals, industrial minerals, and hydrocarbon resources; geophysical and geochemical surveys; coastal zone mapping; and the management of exploration support programs and services.

Mineral Industry Study

In order to address challenges facing the New Brunswick mining industry, the province contracted Dr. George Miller of IGRG Inc. and Dallas Davis of Dalmin Corporation to study the industry and prepare a report (Miller Report). It presents a strategy and 27 recommendations grouped under the following categories: Exploration and Development; Metal Mining; Smelting and Processing; and Industrial Minerals. After extensive consultation with the mineral industry, the province approved the following 15 recommendations, which have been implemented since April, 2001:

1. **Comprehensive Prospector Program:** Financial assistance to prospectors, prospector training, prospector reward and prospector promotion. The Province has allocated $250 000 per year for three years. In 2001, 47 prospectors were awarded a total of $170 000, four prospecting courses were conducted, and nine prospectors received funding to attend the Cordilleran Roundup or PDAC Convention.
2. **Flow-Through Tax Credit Needed:** Following the Federal government announcement of a 15% tax credit for mineral exploration, the department has initiated discussions with the Provincial Department of Finance to evaluate the possibility of allowing an additional 5% tax credit against provincial income tax payable for all investors in exploration companies working in New Brunswick.
3. **Continuation of the Junior Mining Assistance Program:** The Province allocated $350 000 per year for three years. In 2001, nine companies were awarded a total of $345 000.
4. **Deep Drilling Assistance/Advanced Exploration:** The Government has approved an 18% tax credit against taxes payable under the *Metallic Minerals Tax Act*.
5. **Increased Involvement by Premier and Cabinet in Exploration and Mining Development:** The provincial government intends to take a more active role in major conferences and events that could help stimulate the exploration and mining industry in New Brunswick.
6. **Access to Electronic Information:** To help computerize geoscience data, $75 000 per year over ten years was allocated under the Department's A-base budget.
7. **Enhanced Minerals and Energy Division Budget:** $375 000 and two full-time equivalent positions (metallic mineral deposit geologist and asalsistant hydrocarbon resource geologist) were added under the Department's A-base budget. This will allow the Department to carry out joint geoscience programs with the Geological Survey of Canada.
8. **Interdepartmental Senior Management Committee:** Senior management in the departments of Natural Resources and Energy, and Environment and Local Government are working together to address mining issues such as reclamation and development projects.
9. **Review of Non-Profit Charges, Fees, Levies, and Taxes:** A committee, consisting of staff from the Department and the New Brunswick Mining Association, is pres-

ently reviewing this issue to see how the province can improve the level of taxation for the industry.

10. **Energy Costs:** New Brunswick hopes to address this issue through the new energy policy.

11. **Access to Land Base:** Government recognizes that land access is critical for exploration investment. As a result, in the recently established Protected Areas Strategy, the mineral industry was extensively consulted.

12. **Research and Development Cost:** Government is evaluating the request for funding for advanced exploration technologies and training.

13. **Human Resources Development:** Government is looking at the best way to respond to the needs of the industry for training particularly in highly specialized fields.

14. **Province Should Take a Lead Role on Non-Profit Taxes:** This issue was raised recently at the national level during the Mines and Energy Ministers' Conference in Quebec City.

15. **Review of the Metallic Minerals Tax Act:** Government will review the overall tax regime of New Brunswick and determine what actions could be taken to improve the level of taxation affecting the industry.

Geoscience Projects, 2001

Bedrock Geological Mapping – Detailed, 1:20 000-scale bedrock mapping was carried out in the Campbellton (NTS 21 O/15), Fosterville (21 G/13), and Sussex (21 H/12) areas. Mapping at 1:50 000 scale was undertaken in the States Brook area (21 O/13).

Surficial Geological Mapping and Geochemical Surveys – Surficial mapping and till sampling were carried out in the McDougall Lake area (NTS 21 G/07) in the vicinity of the Clarence Stream gold prospect. Till sampling was completed in the Coldstream area (21 J/06). Surficial mapping and till sampling under the NATMAP program were completed in the Kedgwick (21 O/11), States Brook (21 O/13), and Menneval (21 O/14) areas and initiated in the Gounamitz River area (21 O/12). Soil samples were collected along two transects in the southeastern part (21 P/5) of the Bathurst Mining Camp.

Metallic Minerals – Staff continued to update the Mineral Occurrence Database. Investigations are being carried out on the Upsalquitch, CNE and Clarence Stream deposits.

Industrial Minerals – Several gypsum and anhydrite deposits in southern and northwestern New Brunswick were mapped in detail and reports were prepared. Detailed studies on titanium deposits were carried out as was a province-wide survey to investigate the potential of cobblestone and granite sites as reasonable sources of decorative aggregate.

Hydrocarbon Resources – Mapping was concentrated on the southwestern margin of the Carboniferous Maritimes Basin in order to provide insights into the subsurface stratigraphy of the Marysville Subbasin.

Geoscience Information Systems and Annual Summary Reports – Five geoscience databases, Geoscience Publication Index, Mineral Occurrence, Borehole, Core Sample, and Claims, were incorporated into the Minerals and Energy Division website: **www.gnb.ca/0078/minerals/geosciencedatabase/index.html**. A metadata catalogue is being prepared with funding from the Geological Survey of Canada.

"Current Research 2000" and ***"Abstracts, 2001: 26th Annual Review of Activities"*** were recently published. *"New Brunswick Exploration Highlights, 2001"* and *"Preliminary Review of New Brunswick's Mineral Industry, 2001"* are in progress. *"New Brunswick's Mineral Industry, 2001"* will be published in November of 2002.

Partnership Programs

The Geological Surveys Branch works closely with the Geological Survey of Canada, University of New Brunswick, Acadia University, and industry. In co-operation with the Geological Survey of Canada, a high-sensitivity

aeromagnetic survey was conducted in southwestern New Brunswick. In another project, radiometric data collected during 1990 and 1991 by the Geological Survey of Canada will be plotted at 1:50 000 scale. Data from both projects will be available in 2002.

The bedrock and surficial mapping programs being conducted in northwestern New Brunswick (Kedgwick, States Brook, Menneval and Gounamitz River areas) are part of the multi-disciplinary five-year NATMAP project termed "Appalachian Foreland and St. Lawrence Platform Architectures in Québec, New Brunswick and Newfoundland". The New Brunswick work is co-funded by the New Brunswick Department of Natural Resources and Energy (Geological Surveys Branch) and the Geological Survey of Canada.

The Targeted Geoscience Initiative projects in New Brunswick include a groundwater resource assessment of the Carboniferous Basin and metallogenic modelling of gold prospects (Clarence Stream and Poplar Mountain). The Geological Survey of Canada, New Brunswick Department of Natural Resources and Energy (Geological Surveys Branch), and the University of New Brunswick are participating in both projects; in addition, the United States Geological Survey, the New Brunswick Department of Environment and Local Government, and Laval University are participating in the groundwater study.

Review of Activities

The 26th annual Review of Activities was held November 4-7, 2001. The program included technical and poster sessions, core shack, industry trade show and special events. Fifty people attended the field trip to the Clarence Stream gold property, which was sponsored by Freewest Resources Canada Inc. The University of New Brunswick and student chapter of the Society of Economic Geologists sponsored a workshop on "Mineralized Shear Zones: Structural Kinematics to Fluid Flow." A computer workshop on the availability and uses of digital data was organized by the Geological Surveys Branch. An industry forum, also organized by the Branch, focused on gold, base metals, hydrocarbons, and industrial minerals. Approximately 250 delegates attended the Review.

Exploration and Production Statistics

Mineral exploration expenditure surveys for New Brunswick indicate that approximately $12.1 million was spent on mineral exploration in the province in 2000 compared to $10.0 million in 1999. Hydrocarbon exploration expenditures have escalated dramatically during 2001 and are estimated to be $16.7 million.

Although 75% of the mineral claims in effect at year's end were in northern New Brunswick, 58% of the claims recorded during the year were in southern New Brunswick. The number of claims in effect province-wide at year's end has declined by about 10%.

The preliminary value of New Brunswick's mineral production for 2000 is $796.6 million, a decrease of 6.1% from the final value of $848.6 million in 1999.

Exploration Highlights, 2001

Most exploration activities in northern New Brunswick were focused on base metals. Two major and eight junior mining companies and several prospectors were active in the Bathurst Mining Camp. Exploration expenditures in the Bathurst camp in 2001 will be about $5.0 million, down more than $3.0 million from last year due mainly to reduced exploration expenditures by Noranda Inc.

The focus was on gold in southern New Brunswick where about ten junior mining companies and several prospectors were active. Exploration expenditures for gold have been steadily increasing as a result of the delineation of reserves on known gold deposits and the discovery of new gold occurrences. The intensity of exploration and the number of new finds in and around tin-tungsten-bearing felsic intrusions associated with the Saint George Batholith leaves little doubt that a world-class, granite-related gold district is emerging in this part of the province.

Information on available mineral properties in New Brunswick has been compiled by the New Brunswick Prospectors and Developers Association and has recently been included on their website: **www.nbpda.ca**.

During 2001, exploration for industrial minerals focused mainly on expanding the resource potential for high-calcium limestone and titanium deposits. Exploration and development activity for these resources continued at a respectable pace with much attention directed to agricultural and construction materials.

The completion of the Maritimes and Northeast Pipeline has resulted in a boom in oil and natural gas exploration in New Brunswick. Companies currently exploring in New Brunswick include Columbia Natural Resources Canada Limited, Corridor Resources Inc. and Potash Corporation of Saskatchewan Inc. Eleven wells were licensed for a depth of 22 000 metres. In light of this increased activity in New Brunswick, oil and gas legislation is undergoing review.

Nova Scotia Program Highlights 2001

Overview

Base funding for the Mineral and Energy Resources Division in 2001 was $1.8 million, a decrease of approximately 10% from the previous year. With this reduction, the Division has met a two-year program reduction target imposed by the provincial government in April 2000. In 2001, three professional positions were eliminated and the operating budget of the Core Storage Facility was substantially reduced. Because of resource constraints and commitments to ongoing projects, no new field projects were begun in 2001.

Program Highlights for 2001

Geological Mapping and Geochemistry

In 2001, the program of the Geological Mapping and Geochemistry Section featured:

- ✔ Continuation of 1:50 000-scale bedrock mapping in southwestern Nova Scotia. This project has successfully identified new subdivisions and structures in the Meguma Group that have implications for these rocks elsewhere in Nova Scotia. As Nova Scotia's gold deposits are largely hosted by the Meguma Group, advances in understanding its geology have implications for exploration for new deposits and re-evaluations of known deposits. Field work for the project will be completed in the summer of 2002-03.
- ✔ The second year of a three-year collaborative mapping and mineral deposits project with the Geological Survey of Canada in south-central Cape Breton Island, with funding support from the federal government's Targeted Geoscience Initiative. Work to date, involving NSDNR, GSC and university researchers, has resulted in identification of previously unknown resources of high quality clays, and has substantially improved our understanding of the stratigraphy and structure of Carboniferous and older rocks in the project area.
- ✔ Continuation of a bedrock geochemistry project as part of a multi-disciplinary study of mercury contamination in Kejimkukjik National Park in southwestern Nova Scotia. Nova Scotia's participation in this project, supported by Health Canada's Toxic Substances Research Initiative, has increased awareness of the potential for natural introduction of toxic substances by a project team which had previously omitted geology as a potential source for the mercury.

Mineral Resource Evaluation

The Mineral Resource Evaluation Section's program addresses the need for information about Nova Scotia's base and precious metal mineralization, coal and onshore hydrocarbon resources, and industrial minerals. Highlights of this program in 2001 included:

- ✔ Continuation of a major compilation of available bedrock geology and mineral deposits information for the well-known Meguma gold districts in Nova Scotia's Eastern Shore. This project is compiling all pre-existing information on the gold districts and surrounding areas, incorporating this information into a digital database and map, and producing comprehensive deposit reports.
- ✔ Continuation of an ongoing inventory program to locate, characterize and document occurrences and deposits of industrial mineral commodities, including limestone and dolomite, gypsum and anhydrite, salt, barite, celestite, slate, building stone, quartz, and kaolin and silica sand. Much of this work in 2001 focused on Cape Breton Island, with links to the bedrock and surficial mapping components of the Targeted Geoscience Initiative project.
- ✔ Continuation of a program to document Nova Scotia's bedrock and surficial aggregate resources. Nova Scotia's abundance of deep-water, ice-free ports provides many opportunities to export aggregate to the eastern seaboard of the United States, where economic expansion and an aging transportation infrastructure have greatly increased demands for aggregate.

Geoscience Information Services

In 2001, the Geoscience Information Services Section continued to emphasize projects that will make more of the Minerals and Energy Branch's information available as digital products, and to develop applications which will allow users to access, manipulate and download geoscience data from the Internet. Clients may acquire digital products by purchasing disks or CDs, by accessing products on the Division's Public Access GIS system housed on computers in the Halifax library and the Core Storage Facility in Stellarton, or as free downloads from the Division's Internet site at: **www.gov.ns.ca/natr/meb**. Highlights of this activity in 2001 include:

- ✔ Release of three new digital products in PDF format: Land Designation and Ownership in Nova Scotia (Open File Map ME 200-1), Map of Active Mines in Nova Scotia (Version 1, Open File Map ME 2000-2) and Mineral Rights Disposition Map for the Province of Nova Scotia (Version 3, Open File Map ME 2000-6).
- ✔ Initiation of two projects as part of the federal-provincial-territorial initiative to develop a Canadian Geoscience Knowledge Network. The first project is developing Nova Scotia's component of the CGKN Metadata Catalogue, and the second is developing metadata for Nova Scotia's geochemistry databases as a contribution to the CGKN Geochemistry Online project. Both projects were funded in part by the Geological Survey of Canada.

Mineral Promotion

The objectives of the Mineral Promotion program are to facilitate exploration and development of Nova Scotia's mineral resources and to increase awareness and understanding among provincial government departments and agencies and the public of the contributions of the mining industry to Nova Scotia. Highlights of these activities in 2001 include:

- ✔ Efforts to develop and strengthen strategic partnerships and linkages with the fourteen Regional Development Agencies (RDAs) in Nova Scotia. In these partnerships, the Division is able to provide advice to the RDA's on proposals submitted to them related to mineral development. In 2001, interaction with the Strait-Highlands RDA led to the development of a marble quarry in southern Cape Breton Island, and funding support for resource delineation work at two limestone deposits.
- ✔ Participating in a Team Nova Scotia initiative to investigate opportunities for Nova Scotia goods and services in international markets. One such activity in 2001 has led to advanced discussions between provincial aggregate producers and potential buyers in the British Virgin Islands.

Prospectors Assistance Program

Although funding for Nova Scotia's Prospectors Assistance Program (PAP) expired on March 31, 2001 with the termination of the Canada - Nova Scotia Economic Diversification Agreement, some $77 000 in unspent funds from this four-year agreement were available in 2001. These funds were used to:

- ✔ Provide funding assistance for work on their claims by twelve prospectors.
- ✔ Provide financial assistance for travel to twelve prospectors to permit them to promote their properties at the Annual Meeting of the Prospectors and Developers of Canada.
- ✔ Develop an Internet-based prospecting course.

In the absence of funding to continue the assistance program in the future, the Department of Natural Resources will work with the Nova Scotia Prospectors Association to provide seminars, workshops and field trips for those interested in acquiring and improving their skills as prospectors.

Newfoundland and Labrador Program Highlights 2001

Introduction

The Geological Survey of Newfoundland and Labrador's (GSNL) program for 2001-2002 consisted of 26 projects having a total budget of $3.76 million. This amount includes an additional $100 000 allocated to the Survey from elsewhere in the Mines Branch, as well as a 5% collective-agreement salary increase over the previous fiscal year. All the funding is from provincial appropriation.

Exploration expenditures in the province during 2001 were projected to be $25 million. About $11 million of that is projected for Labrador, including approximately $5 million by Voisey's Bay Nickel. Approximately $14 million is projected for the Island. Overall, this represents an increase of exploration in the province of approximately $2 million over the previous year. Over 15 000 claims were staked in the province in 2001, approximately twice as many on the Island as in Labrador. They form part of the nearly 47 000 claims in good standing for the whole province.

Program Highlights

Bedrock Geology Surveys

Mapping of the entire Grenville Province in Labrador at 1:100 000 scale was completed in 2001. This significant milestone combines the long-time work of Charles Gower in the east with the more recent efforts of Don James in the west. Don was joined by Leo Nadeau of the GSC the past two field seasons under the auspices of GSC's Targeted Geoscience Initiative (TGI) entitled "Tectonic framework and evolution of eastern Grenville Province". TGI support accelerated completion of the Grenville project.

James and Nadeau mapped in the Lac Brulé area during 2001, a region mostly underlain by the Paleoproterozoic Mealy Mountains Intrusive Suite, which is intrusive into orthogneisses. All these rocks are intruded by mafic to granitic rocks of the Mesoproterozoic Atikonak River Massif and late to post Grenvillian granites. A gabbro body in the Mealy Mountains Intrusive Suite contained combined platinum-palladium-gold values of up to 1.38 grams per tonne.

Mapping at 1:50 000 scale was continued in the west-Newfoundland carbonate platform by Ian Knight (lithostratigraphy) and Doug Boyce (biostratigraphy). Working southwest of Corner Brook, they identified two separate thrust sheets in Middle Ordovician carbonates which are folded around the Acadian North Brook Anticline. They also spent five weeks in east-central Greenland, at the invitation and expense of the Geological Survey of Denmark and Greenland, to study platformal rocks comparable to those in west Newfoundland. The collaboration between the two Surveys has been a mutually beneficial one. The Canadian Society of Petroleum Geologists also presented Ian Knight with the prestigious Douglas Medal for 2000.

Knight and Boyce's work also contributed to the eastern Canada "Bridges" NATMAP project, a study of five transects through the Appalachian Foreland and Platform. The west-Newfoundland component of NATMAP also includes detailed stratigraphic and structural analyses by researchers at Memorial University and the University of Alberta in the Humber Arm Allochthon, where similar deformational styles of early thrusting and later upright folding are being defined.

The late Proterozoic molasse-facies rocks of the Bonavista Peninsula in eastern Newfoundland have recently been the focus of exploration for sedimentary-hosted copper mineralization. Sean O'Brien of the GSNL and Art King of Memorial University carried out detailed mapping through five corridors across the peninsula during 2001, to better establish the stratigraphic framework of the various formations. This follows the release of data from the Survey's 2000 geochemical project early in the summer, which resulted in significant new staking. O'Brien and King were able to demonstrate that rocks on the peninsula can be correlated with others of similar age and lithology throughout eastern Newfoundland, indicating the widespread pres-

ence of large-scale well-preserved basins containing the potential for copper mineralization.

Sean O'Brien also continued his 1:50 000-scale mapping of Precambrian volcanic and sedimentary rocks of the Avalon Peninsula, particularly in the Avalon high-alumina belt near Conception Bay. The belt has demonstrable low-sulphidation epithermal gold potential, and a new showing (Bergs Prospect) uncovered in 2001 is a vein-breccia complex returning assays up to 7.2 g/t gold. Sean also mapped an angular unconformity in the area between Cambrian conglomerates and Precambrian volcanics, showing that the gold mineralization is Precambrian.

Surficial Geology/Geochemical Surveys

The Survey was pleased to hire a new geoscientist in 2001 in the person of Dr. Shirley McCuaig. Shirley was immediately assigned a project in southeastern Labrador (Grenville Province) to carry out surficial-geology mapping and till sampling, to stimulate exploration interest. Happily, her field area was changed somewhat at the last minute to reflect the fact that Falconbridge had staked most of it and would do a similar study. Shirley then moved to the northeast in the Alexis River region, an area underlain by thin bouldery till. Some 460 samples were collected at approximately one every six square kilometres; results will be available in 2002.

Jerry Ricketts carried out surficial-aggregate surveys in the western part of the Avalon Peninsula. Several gravel outwash deposits were mapped, some close to roads. Jerry is confident that enough resource has been identified to supply the Argentia–Placentia area for its foreseeable development needs.

John McConnell sampled streams from the South Brook watershed to support the Mines Branch study of the extent of acid-mine drainage from the abandoned workings of Rambler Mines. Analysis will provide data to define areas of concern and help the Branch plan amelioration strategies.

Mineral Investigations

Lawson Dickson investigated the industrial-mineral potential of high-quality dolomite (Cape Norman) and quartzite (Highlands of St. John) on the Great Northern Peninsula. Detailed mapping and sampling of the two areas were carried out to determine their purity; results are pending. Lawson has been seconded from the Survey's bedrock-mapping section to the mineral deposits section.

A new project was initiated in 2001 in the Buchans–Robert's Arm Belt of central Newfoundland. Andy Kerr will examine mineralization, compile exploration data and develop geological and geochemical databases to assist future exploration. The past field season was spent concentrating on areas of recent exploration (*e.g.*, Gullbridge and Powderhorn Lake) and examining drillcore. Exploration companies in the region are offering their full cooperation.

The Survey also supported three Masters theses by students at Memorial University. Glen Penney is doing geochemical and geochronological analyses on kimberlites and ultramafic lamprophyres from several sites in northern Labrador. Mike Dean is studying the Ordovician Huxter Pond felsic volcanics and the sphalerite–chalcopyrite-bearing Katie Prospect to develop exploration vectors. Jeff Pollock is attempting to distinguish favourable mineralizing units in the Tally Pond volcanics of central Newfoundland, host to the Duck Pond and Boundary deposits. Jeff is also being supported by the GSC's second TGI project in the province, the "Red Indian Line", under the leadership of Cees van Staal. Cees and his team are working mainly in the Victoria Lake Group and adjacent units, with a view to refining the position of the Red Indian Line or Iapetus suture zone, as well as better understanding the structure and stratigraphy of this highly prospective part of central Newfoundland.

St. John's 2001 / NAMS-2

Most of the Geological Survey staff, as organizers and/or presenters, were involved in the GAC-MAC Joint Annual Meeting held in St. John's on May 27-30, 2001. The meeting had over 1000 registrants, ran 4 symposia, 19 spe-

cial sessions, 13 field trips, two short courses and two workshops, and attracted 47 exhibitors. The second North Atlantic Minerals Symposia, sponsored by the Geological Survey of Newfoundland and Labrador and the Geological Survey of Ireland, was one of the four symposia held under the St. John's 2001 umbrella. NAMS offered an eclectic program of science and mineral-development-related topics to an international audience. The third NAMS takes place in Dublin, Ireland, August 31 - September 3, 2003.

Open House 2000

The 25th Annual Review of Activities of the Department of Mines and Energy took place on November 1, 2000, at the Delta St. John's Hotel. The first Review, or Open House, took place in 1977 in the foyer and corridors of the Howley Building, home of the Survey's geochemical laboratory. The next year, it was moved to the Holiday Inn and in subsequent years to the larger convention facilities of the Hotel Newfoundland or the Delta St. John's. Over that time, including the halcyon days of the MDAs, the Geological Survey has presented the results of its annual field-work and other studies to an appreciative industry client group. We hope to continue the tradition.

As usual the 25th Review was held in conjunction with the Newfoundland Branch of the CIM. Approximately 250 delegates attended the Review and Conference. Minister Lloyd Matthews was out of the province but Deputy Minister Brian Maynard spoke on his behalf. GSNL and GSC geoscientists presented some 31 posters. Technical papers included talks on the tectonic evolution of Labrador (Gower – GSNL), till geochemistry (Liverman – GSNL) and the structure and stratigraphy of the Victoria Lake Supergroup (van Staal – GSC). GSNL's Randy Meehan also received CIM's Certificate of Appreciation for his tireless support of the Newfoundland Branch.

Yukon Program Highlights 2001

Overview

Now in its sixth year, the Yukon Geology Program (YGP)is a *de facto* Yukon Geological Survey consisting of two integrated and jointly managed offices with different administrative structures. Federal funding is provided through the Exploration and Geological Services Division (EGSD), Yukon Region of the Department of Indian Affairs and Northern Development (DIAND), while Yukon Territorial Government (YTG) and cost-shared (YTG/DIAND) funding comes through the Mineral Resources Branch of the Department of Economic Development (YTG). YTG independently manages and funds the Mineral Assessment Group and the Yukon Mining Incentives Program (YMIP). These are described separately. The Geological Survey of Canada (GSC) also maintains an office with the Program.

The Yukon Geology Program is an informal and temporary organization that will be transformed into a Yukon Geological Survey when the responsibilities of the Northern Affairs Program of DIAND are devolved to YTG. A Devolution Transfer Agreement is now signed and the transfer date firmly set for April 1, 2003.

Staff Changes

During the past year, the Program saw several staff changes. On the Northern Affairs side, Karen Pelletier joined the Geology Division after the Mining Land Use Division was amalgamated with the Mineral Rights Divisions. Karen will continuing her role as an environmental geologist, and will take on additional duties including land use issues. Steve Traynor and Rick Zuran have joined the Division for a short period to assist with bringing the Yukon MINFILE database up to date. On the YTG side, Rod Hill has returned to his substantive position as manager of the Mineral Resources Branch, in place of Shirley Abercrombie; Tammy Allen has taken a short-term secondment to the Oil and Gas Division, replacing Riona Freeman; and Gord Nevin has taken a one-year leave of absence. Roger Hulstein and Robert Stroshein have joined the Mineral Assessment Group on term positions.

Fieldwork

The Yukon Geology Program is committed to providing a balanced complement of field projects that not only quickly stimulate the mining and exploration industry, but also take the longer-term view towards developing an understanding of the Yukon regional geological framework, and building the Yukon Geoscience Database.

Ancient Pacific Margin NATMAP

The Yukon Geology Program continued to commit substantial resources to a joint Geological Survey of Canada-British Columbia Geological Survey Branch -Yukon Geology Program initiative, the Ancient Pacific Margin NATMAP (National Mapping Program) project. This project is a multidisciplinary effort to better understand Yukon-Tanana and Kootenay terranes, arguably the least understood parts of the North American Cordillera.

In the Yukon, mapping projects are underway in Finlayson Lake map area (Don Murphy), Glenlyon (Maurice Colpron), Stewart River (Steve Gordey, Jim Ryan/ GSC), and Wolf Lake (Charlie Roots/GSC). In southern B.C., the Project also includes regional mapping by Bob Thompson of the GSC, and in east-central Alaska, mapping by David Szumigala of the Alaska State Geological Survey, and mineral deposit studies by Cynthia Dusel-Bacon of the U. S. Geological Survey. Participation by numerous university researchers, graduate students and other specialists has greatly added to the depth and complexity of the project. In Yukon, these include lithogeochemical studies in the Finlayson Lake area by Steve Piercey (now at Laurentian University) and Jim Mortensen of The University of British Columbia, and mineral deposit studies by Suzanne Paradis of the GSC.

Regular workshops and field trips are one of the main benefits of such a large and diverse

project. This summer Charlie Roots led a field trip along the Alaska Highway, from Teslin to Rancheria.

In 2001, the Yukon portion of the Project received a substantial boost from funds obtained through NRCan's Targeted Geoscience Initiative. In the Finlayson Lake map area, the extra funding enabled a program of accelerated regional bedrock mapping and till geochemistry. By using a contract helicopter for five weeks, four expert NATMAP participants (D. Murphy, S. Gordey, M. Colpron, and C. Roots) were able to map the northern half of the map sheet at 1:100 000 scale. As well, J. Bond, A. Plouffe and two assistants successfully carried out a regional till geochemical sampling program across the extensive overburden-covered parts of the area. Promising geological and geochemical targets were defined as a result.

Elsewhere, Maurice Colpron continued mapping in Glenlyon map area. Charlie Roots continued mapping in the western half of Wolf Lake map area and in the adjoining northern half of Jennings River map area. In the Stewart River area, work included GSC bedrock mapping by Gordey and Ryan, surficial mapping by Lionel Jackson for the GSC and placer deposit studies by Grant Lowey. The second and final year of airborne multispectral geophysical surveys funded under the Targeted Geoscience Initiative resulted in total coverage of about two-thirds of the map sheet. Data released from the first survey has already resulted in staking and prospecting of promising targets.

Additional Geophysical Surveys

The success of previous Multispectral Geophysical Surveys prompted the Territorial Government to fund the GSC to administer a survey over prospective ground near the Minto and Williams Creek copper deposits northwest of Carmacks.

Central Forelands NATMAP Project

The Yukon Geology Program is also a partner with GSC Calgary staff and university researchers in the Central Forelands NATMAP Project. The Central Forelands Project is primarily focused on hydrocarbon-related geoscience, and includes regional mapping and topical studies in two separate areas: Trutch (94G) and Toad River (94N) in northern British Columbia, and Fort Liard (95B) and La Biche (95C) in Yukon and Northwest Territories. Tammy Allen and Lee Pigage joined the Project in La Biche map area in southeast Yukon. Now in the second of three years, the project will better define the geologic framework of the area with the highest hydrocarbon potential in all of Yukon. Mapping in the eastern part of the La Biche area has resulted in new structural interpretations that are key to hydrocarbon exploration. Work by Lee and Tammy in the western part of the map area has resulted in significant reinterpretation of both structure and stratigraphy.

Anvil District Project

Another major effort by the Yukon Geology Program is to synthesize and enhance the geological database of the Anvil district. The Faro mine remains closed for the foreseeable future, but the possibility remains for renewed exploration and mining at some point. Lee Pigage has completed bedrock mapping, and has released a complete set of 11 geological maps of the district at 1:25 000 scale, and a compilation at 1:100 000 scale. A final report will be prepared in 2002. Jeff Bond has completed surficial mapping and a till geochemical survey, and released 11 final maps and a bulletin in the spring of 2001.

Mineral Deposit Studies

Craig Hart has begun a year's leave to undertake a PhD Program at the University of Western Australia. Most of the requirements for the degree will entail writing papers on his previous field studies of the Tintina gold belt and other Yukon gold occurrences. Craig also assisted many of the students who received support from the YGP to study various aspects of Yukon gold deposits. These included Mark Lindsay and Julian Stephens, under the supervision of Tim Baker at James Cook University and John Mair at University of Western Australia; and Erin Marsh and Seth Mueller under the supervision of Rich Goldfarb at the US Geological Survey.

Julie Hunt has returned to university to undertake a PhD program at James Cook University in Australia. YGP is funding thesis field-

work. Julie will undertake research on the Wernecke Breccias and take advantage of the Australian connection by comparing the Yukon breccias with similar Australian rocks which host giant ore deposits.

Placer Studies

Bill LeBarge and Mark Nowasad continued their studies of the relationship between sedimentology, grain size distribution, and water quality of effluent from placer deposits. Fieldwork is now complete and the technique will be evaluated for possible long-term applications and further research. Data gathered from this study will be used in the review of the Yukon Placer Authorization, which is currently underway.

External Support

The YGP is providing financial and logistical support, or is a partner with graduate students and university researchers in the following projects.

John Laughton is undertaking an MSc thesis on the Slab volcanics in the Wernecke Breccias under the supervision of Derek Thorkelson at Simon Fraser University. Derek also continued his research on Proterozoic rocks and mineral deposits in the Wernecke Mountains, with a small study of the Bear River dikes.

Gregory Shellnutt undertook detailed mapping and study of ultramafic rocks in the Yukon as part of a PhD program at the University of Victoria under the supervision of Dante Canil. The project aims to use petrologic and geochemical studies to determine the mode of origin of ultramafic bodies in a variety of terranes and tectonic settings. The results should help identify those rocks with the most potential to host deposits of Platinum Group Elements.

Kaesy Gladwin began mapping and structural studies to characterize the boundary between the Yukon-Tanana and Cassiar terranes in southeast Glenlyon map area. This is an MSc project under the direction of Stephen Johnston at the University of Victoria.

Tim Baker at James Cook University (JCU) in Australia has completed work on understanding the fluid compositions of the Eagle Zone gold veins at Dublin Gulch. This is a step towards characterizing fluids in intrusion-related gold systems.

Julian Stephens under the direction of Tim Baker at JCU has been working on the nature of the brittle structural controls of intrusion-related gold systems in central Yukon with a focus on Dublin Gulch and Clear Creek. This will be used to develop a structural exploration model.

Mark Lindsay under the direction of Tim Baker at JCU has been developing a structural history and mineral paragenesis for the Brewery Creek gold deposit. He will direct future efforts towards determining what the critical factors were that resulted in gold deposition.

Similarly, Veronica Brown at JCU has completed her Honours thesis on the Ray Gulch Tungsten Deposit at Dublin Gulch. She has determined that the lack of a retrograde alteration event on the tungsten skarn is the reason for the lack of gold enrichment in that deposit.

John Mair under the direction of David Groves at the University of Western Australia has been examining the metallogenic relationships between gold, tungsten, and silver-lead-antimony mineralization in intrusion-related systems with an emphasis on the Scheelite Dome area. In particular, John has found some very high gold grades in tungsten skarns, and this study will aid in our understanding of those metallogenic controls.

Erin Marsh has recently completed her MSc thesis at the University of Colorado on the "Geology and geochemistry of the Clear Creek intrusion-related gold occurrences", and has found, among other things, that Au±Bi±W related veins are up to 100°C hotter than Ag-Pb veins.

Seth Mueller and Lang Farmer, also at the University of Colorado, have used isotopes to indicate the sources for magmas related to intrusion-related gold deposits in the Clear Creek area.

David Selby and Rob Creaser at the University of Alberta have been applying a new technique for dating mineral deposits to Yukon

rocks. The Rhenium-Osmium method allows the dating of sulphide minerals, in particular molybdenum, and they have been using it to understand the timing of intrusion-related sulphide deposition throughout the Yukon.

Phil McCausland and David Symons at the University of Windsor in Ontario are wrapping up paleomagnetic studies on Mesozoic and Early Tertiary granites in Yukon-Tanana Terrane. Progress so far indicates differences in the timing and amount of motion between Yukon-Tanana Terrane and Stikine Terrane rocks. Rocks as young as Eocene have endured up to 40° of post-emplacement, tectonic rotations.

In addition to providing geochronological support to the GSC's Steward River project, Mike Villeneuve has been using argon geochronology to: 1) determine the cooling and uplift history of the Klondike region to aid in understanding mineralizing and tectonic processes in that region; 2) define the timing of recent volcanism in the Yukon, particularly the Fort Selkirk region; and 3) provide timing constraints on intrusion-related gold mineralization in the Tintina gold belt.

In order to make Regional Stream Geochemical data from the National Geochemical Reconnaissance Program more accessible, Peter Friske with the Geological Survey of Canada in Ottawa was funded to reformat existing open file data in PDF Format. The first four Open Files were released in December.

Mineral Resource Assessments

The Yukon Mineral Resources Branch provides information on geology and mineral potential of areas undergoing land use planning. During the spring, 2001, the Yukon Government committed to identifying areas of interest for representation of 13 ecoregions. To assist with area selection, regional mineral potential maps were produced according to the methodology devised by the United States Geological Survey and refined by the British Columbia Geological Survey. Detailed mineral assessments, including fieldwork, were also conducted in three areas to assist in developing land management guidelines for special management areas established under first nation final agreements, and in areas of historical conservation interest.

Yukon Mining Incentives Program (YMIP)

Ken Galambos administers the Yukon Mining Incentives Program for the Yukon Mineral Resources Branch. This year, a total of $917 400 was offered to 59 successful applicants for prospecting, grassroots exploration and initial development of properties. Twenty proposals were approved under the Grubstake and Grassroots modules of the Program, and the rest, under the Target Evaluation Module. Highlights for the year included: the discovery of significant gold and pathfinder anomalies in both soils and rock; the extension of known showings through prospecting and geophysics; and the discovery of an epithermal system beneath an Enzyme Leach soil anomaly.

Products And Services

Industry Liaison and Support

Mike Burke and Bill LeBarge, our main links to the exploration industry, continued to monitor Yukon hard-rock and placer mining and mineral exploration activity, visit active properties, review reports for assessment credit, and maintain the assessment report library.

Yukon MINFILE

Robert Deklerk maintains the Yukon MINFILE, the Yukon's mineral occurrence database, which is another mainstay of the Yukon Geology Program. We have completed an upgrade from Microsoft Access Version 2 to Access 97 with major revision and simplification of the database structure. The updated digital version with data revised to 1998, was released on CD-ROM in the spring of 2001. New mineral occurrence location maps produced in Arcview accompany the release.

Yukon GEOPROCESS File

The Yukon GEOPROCESS File, under the direction of Diane Emond, is an inventory of information on geological process and terrain

hazards, including 1:250 000-scale maps showing permafrost, landslides, recent volcanic rocks, structural geology, and seismic events and also includes references and summaries of bedrock and surficial geology. The GEOPROCESS File is intended as a planning aid for development activities and is available for most areas south of 66 degrees latitude. The maps have recently been standardized in colour, and will soon be released on a single compact disk.

H. S. Bostock Core Library

Mike Burke and Ken Galambos maintain the H.S. Bostock Core Library. The facility contains about 128 000 metres of diamond drill core from about 200 Yukon mineral occurrences. Confidentiality of material is determined on the same basis as mineral assessment reports. Confidential core can be viewed with a letter of release from the owner. Rocks saws and other rock preparation equipment are available to the public.

Information Management and Publications

The Yukon Geology Program is now converted fully to digital publishing. All new geological maps and publications are produced from a digital format on-demand, and all of our recent products are available free of charge in PDF format from our website at: **www.geology.gov.yk.ca.** We are also pleased to make spatial data available through our interactive map server. The Map Gallery can be accessed through the YGP website and the YTG Department of Economic Development website. It currently allows viewing of regional geology, MINFILE locations, topography, roads and communities. Planned enhancements will include allowing downloading of vector data, and adding additional information such as Regional Stream Geochemistry, geophysics, geochronology and paleontology. The Map Gallery is the prototype for the Yukon Government's Data Access Window. Eventually, coverages such as mineral claims from other agencies will be available.

Northwest Territories Program Highlights 2001

Introduction

The NWT's "geological survey" function is delivered by the C.S. Lord Northern Geoscience Centre, a jointly-funded partnership between the federal Department of Indian Affairs and Northern Development (DIAND) and the territorial Department of Resources, Wildlife and Economic Development (RWED). While administration of the regulations governing exploration and development remains a federal responsibility, the two departments are working to merge all other activities into a single, shared program.

C.S. Lord Northern Geoscience Centre

A new building to house the C.S. Lord Northern Geoscience Centre is currently under construction in Yellowknife, and is slated for completion in spring, 2002. Once complete, federal and territorial government staff will co-locate, and the organization will be re-aligned such that work units and reporting relationships will be based on program areas (*e.g.* bedrock mapping, petroleum studies, data management, *etc.*), rather than on "mother" organization (*i.e.* DIAND and RWED). In February 2002, a geoscientist from GSC-Calgary office will take on a two-year assignment with the Centre, to act as overseeing manager for the transition.

Geoscience Program

The C.S. Lord Northern Geoscience Centre carried out four major field-based projects in 2001, all of which will wrap up in fiscal year 2002-2003. The Snare River bedrock mapping project in the southwestern Slave Province continued upgrading existing bedrock data and documenting the tectonothermal evolution of the area. Annual maps are being released at 1:50 000 scale as Open Files. Mapping in the Walmsley Lake area (southeastern Slave Province) is in its second of three years. This project is funded in part by the GSC through the Targeted Geoscience Initiative (TGI), and involves bedrock and surficial mapping, integrated with igneous and metamorphic petrogenetic studies. The GSC's contribution includes regional geochronology, isotopic fingerprinting of granitoids, and geophysical studies of the crust and underlying lithosphere, in part in support of diamond exploration. Both mapping projects (Snare River and Walmsley Lake) will be released as final digital products in 2003.

Two multi-disciplinary mineral deposit studies are also underway, both in collaboration with GSC through the TGI. The first is the Yellowknife EXTECH III project, in its third of four years. The study is aimed at characterizing structural, chemical, stratigraphic, and other controls on the distribution of ore in the Yellowknife gold mining camp, and will lead to improved exploration models for the Yellowknife greenstone belt in particular, and Archean lode gold deposits in general. Final products for the EXTECH are currently in the planning stages. The second project is examining the potential for MVT-type Pb-Zn mineralization in the northern part of the Western Canada Sedimentary Basin. This study is being carried out in collaboration with GSC-Calgary and the Alberta Geological Survey.

In addition to field-based studies, the Centre undertook several compilations of geologic data, and provided support for a number of other projects. The NWT Petroleum Resources poster series contains information about the NWT's sedimentary basins and summarizes exploration and production activity. The posters were updated and re-released this year, and staff undertook a pool analysis in the Cameron Hills area (underway). Four digital compilations of data filed as representation work for diamond exploration were produced: a database of kimberlite indicator picking results from till samples (third volume); a kimberlite indicator mineral chemistry database; a compilation of aeromagnetic data and georeferenced images; and a compilation of drill holes targeting kimberlites (to be released early in 2002). A study of the mineralogy and geochemistry of alkaline rocks in the Slave Province is underway, and logistical and financial support were provided for several undergraduate and graduate student theses, including two projects in the NWT Cordillera.

Two resource appraisal geologists were hired this year for terms of 3 years. They will carry out mineral and petroleum resource appraisals on candidate areas identified under the NWT Protected Areas Strategy, and on lands selected for withdrawal under NWT land claims negotiations. While the positions have been filled, funding for carrying out the resource appraisals continues to be uncertain. To date, work has focussed on compilations of existing data and identification of information gaps; resources for collection of new data to fill these gaps are actively being sought.

District Geologists monitored exploration and mining activity in the territory, and carried out 8 site visits. Over $15.6 million worth of representation work (48 reports) was filed in the NWT this year, and greater than $13.6 thousand in sales (assessment reports, publications) were recorded. A total of 4 Open Files, 4 Open Reports, and 2 Mineral Potential Series products were released in 2001. In April, DIAND's Nunavut Regional office began accepting assessment reports, and the NWT Region moved Nunavut files to Iqaluit. Clients were notified that although the Yellowknife office will continue to retain copies of some files, Iqaluit is the new source for information on Nunavut geology.

Progress on NORMIN.DB, NWT and Nunavut's on-line database (NORthern MINerals DataBase), was slow in 2001, as no funding for data entry was received. However, efforts to link the reference portion of NORMIN to the Canadian Geoscience Knowledge Network continued, and we expect to have completed this by March 2002.

$75 000 in grubstakes were issued in the NWT in 2001. Outreach activities such as classroom visits, career and science fairs, science camps and prospector training courses were delivered.

Exploration/Mining Activity

The NWT's three mines continued to operate in 2001. Miramar Mining Corporation's Con and Giant gold mines produced 65 937 ounces in the first half of 2001 at a cost of $US 258/oz. Miramar gave notice that it would return the Giant Mine property to DIAND in December 2001, but would continue operations at the mine until late 2002. Currently Con Mine is expected to close in 2004. BHP Billiton Limited Group operated the EKATI diamond mine, reporting 3.6 million carats from the Panda pipe in the 16-month period ending May 31, 2001. In October they began production from their second open pit, the Misery pipe.

Development of Diavik Diamonds Inc's mine is on schedule; at the end of August, construction was over one third complete. Production is anticipated early in 2003. De Beers Canada Mining Inc. has applied for permitting to open the NWT's third diamond mine at Snap Lake. They expect to receive approvals in 2003, and anticipate production in 2006.

North American Tungsten began rehabilitating the CanTung Mine on the NWT-Yukon border. Production got underway in December, 2001. The deposit, together with the MacTung deposit about160 kilometres north, contains about 15% of the world's proven tungsten resources. The company has negotiated contracts to supply tungsten to European consumers over the next 3 years.

Diamond exploration was carried out on 23 properties this year, and included over 21 000 line-km of airborne geophysical surveys (mag +/- EM), as well as drilling on 14 properties. Bulk samples ranging from 56 kilograms to 635 tonnes were taken, and till samples were collected from 12 properties. Ground geophysics included a 2D seismic reflection survey, undertaken on north of Snap Lake by Diamondex Resources Ltd. in conjunction with UBC. This is the first application of a reflection seismic survey to kimberlite exploration; the data are still being processed. In total, 14 new kimberlite pipes and several dikes were reported in 2001.

Exploration for metals targeted a variety of commodities and deposit types in 2001. A total of 23 properties were explored for gold, base metals, nickel-PGE's, tantalum, tungsten, and polymetallic cobalt-gold-bismuth-copper. Highlights included an ongoing feasibility study and application for a land use permit for the Prairie Creek base metals deposit (Canadian Zinc Corp), further metallurgical testing of Furtune Mineral's NICO Co-Cu-Au-Bi deposit, preliminary metallurgical testing of ore from the Ta-bearing Thor Lake deposit, and continued de-

lineation of the Sunrise VMS deposit (Hemisphere Development Corp.).

Geoscience Forum 2001

The 29th annual Yellowknife Geoscience Forum was attended by over 600 delegates this year. The technical committee ran three concurrent speakers' sessions per day, covering government geoscience programs, exploration for metals, diamonds and petroleum, and regulatory/environmental issues in NWT and Nunavut. In addition, the Forum featured poster and core displays, a trade show, and numerous social events.

The Canada-Nunavut Geoscience Office (C-NGO) is a collaborative partnership between the Government of Nunavut's Department of Sustainable Development, DIAND and NRCan that responds to these agencies' common geoscience program interests. The C-NGO has been fully operational for 2 years, and operating a number of geoscience projects, ranging from regional, multi-disciplinary mapping initiatives and field-based thematic studies in priority areas across Nunavut, to office-based outreach projects. Both regional integrated mapping projects undertaken by the C-NGO are operated in collaboration with the Geological Survey of Canada, as is the thematic investigation of zinc mineralization in the Arctic Islands.

The administration and regulation of Crown surface and sub-surface rights is carried out by DIAND's Nunavut Regional Office in Iqaluit. The Mining Recorder's Office administers mineral claims, prospecting permits, and mining leases, while the Land Administrator issues land use permits. The Mineral Resources Division reviews and archives assessment data filed by industry, tracks industry activity in the territory, and undertakes concise research projects in conjunction with partners such as C-NGO, NTI, and GN. DIAND's Northern Affairs Program in Ottawa assists the Nunavut Office through policy and regulation development, royalty administration, and administration of oil and gas rights.

Geoscience and Related Activities (C-NGO unless otherwise indicated):

Regional Integrated Mapping

Committee Bay area, central mainland

Archean greenstones of the Prince Albert Group and surrounding metaplutonic rocks on parts of four NTS 1:250 000 map sheets are the subject of a multi-disciplinary bedrock and surficial mapping investigation. The bedrock component of the project is co-led by Hamish Sandeman (C-NGO) and Tom Skulski (GSC); the surficial mapping component is led by the C-NGO's Ted Little. The region has elevated potential for gold and base metal mineralization, as well as for diamondiferous kimberlites. Following fieldwork in the summers of 2000 and 2001, new 1:100 000-scale bedrock geology maps of NTS 56K, 56J (north) and 56O (south) have or will shortly be published as GSC Open Files. Numerous reports outlining the preliminary results of this work are reported in the GSC's 2001 and 2002 Current Research volumes. One Ph.D. and five M.Sc. mapping-based studies of aspects of the bedrock and surficial geology are presently being supported by the project.

Funding under the Targeted Geoscience Initiative has enabled acquisition of regional aeromagnetic and drift-prospecting data. The aeromagnetic survey, initiated in the summer of 2000 and completed in the summer of 2001, was flown with a line spacing of 400 metres; these data will be released by the GSC early in 2002. The drift-prospecting program, focussing on Au and Ni-PGE mineralization, was completed for the western half of the project area, and will continue across the eastern area in 2002.

Central Baffin Island

The Archean rocks of the northeastern Rae craton and the Paleoproterozoic rocks of the Piling Group that cover the continent's southern margin of the continent will be mapped on parts of four NTS 1:250 000-scale sheets. Indications of anomalous values of a variety of commodities, including Zn-Pb-Ag, Ni + PGEs and Au, are present in the area. The bedrock component of the project is lead by David Scott (C-NGO) and Marc St-Onge (GSC); the surficial mapping component is led by Lynda Dredge (GSC). The results of 2000 and 2001 bedrock mapping have been published as 1:100 000-scale GSC Open Files (NTS 27B/W, 37A, 37D). Numerous reports outlining the preliminary results of this work are reported in the GSC's 2001 and 2002 Current Research volumes. Two doctoral and four M.Sc. studies are presently being supported by the project. In addition to the systematic regional mapping, a variety of thematic surveys, such as a teleseismic, magnetotelluric and gamma spectrometry are also being undertaken.

As a result of these new field activities, several major companies, including Teck-Cominco, BHP-Billiton and Falconbridge have established land positions and are actively exploring in the area.

Thematic Studies

Arctic Islands Zinc

In collaboration with GSC-Calgary, and with the support of Teck-Cominco and Noranda, the second year of a study that will establish the regional structural and stratigraphic controls on zinc-lead mineralization in the Polaris District has been completed. Elizabeth Turner (C-NGO) and Keith Dewing (GSC) are the project co-leaders. Preliminary results of this work are reported in the GSC's 2001 and 2002 Current Research volumes. Two M.Sc. students are undertaking detailed structural investigations, and geochemical and isotopic analytical programs are ongoing.

Archean Gold, Meadowbank area

Ross Sherlock has undertaken fieldwork for an investigation of the structural setting and metallogenesis of gold in the Meadowbank area of the central mainland of Nunavut. An overview of the field results was presented in the GSC's 2001 Current Research volume, and a detailed map of the deposit area was published as a GSC Open File in December, 2001. Analytical work on the project is ongoing, and completion of the project is expected early in 2002.

Archean Gold, Hope Bay greenstone belt (C-NGO, DIAND)

An investigation of the structural and lithological setting and metallogenesis of gold in the Hope Bay greenstone belt of western Nunavut was initiated in 2001 with the support of the Hope Bay Gold/Miramar Mining joint venture. Ross Sherlock (C-NGO) and Rob Carpenter (DIAND) undertook detailed structural, lithological, and alteration mapping, and core logging were completed in the poorly understood Madrid area, and analytical work is ongoing. Overviews of the results of fieldwork were presented in the GSC's 2002 Current Research volume and various symposia. Further fieldwork is planned for 2002 in collaboration with the joint venture partners.

North Baffin Zinc

In collaboration with Breakwater Resources, operators of the Nanisivik Mine (Zn-Pb-Ag), a project to establish the regional stratigraphic and structural controls on mineralization has been initiated. Ross Sherlock and Elizabeth Turner are co-leading the project. Digital compilation of surface geology at 1:50 000 and alteration studies are nearing completion, and 3-D modeling of the geologic setting of mineralization and a detailed stratigraphic investigation to determine possible primary controls on mineralization is underway. Detailed mapping in the vicinity of the mine was undertaken during the summer of 2001 by Keith Patterson and Kelli Powis; a report of fieldwork is presented in the GSC's 2002 Current Research volume, and a detailed bedrock geology map will be published as a GSC Open File in 2002.

Western Churchill NATMAP wrap-up

Support for the completion of several sedimentological, geochronological and tectonic syntheses of parts of the Western Churchill NATMAP project area concluded as planned in December, 2001. Led by contract research scientist Larry Aspler, these results have been presented at various meetings and workshops throughout the past several years, and have been published in or submitted to the international refereed literature.

Outreach Projects

Climate Change in Nunavut

A poster entitled "Degrees of Change: Climate Change in Nunavut" has been completed as part of a national, Climate Change Action Fund sponsored program to raise awareness of the impacts of climatic change on everyday life. The Nunavut poster combines Inuit traditional knowledge and western scientific ideas to relate information to a wide range of users. As the effects of this change have already been widely noted by the public, there has been great interest in this project. A version of this poster is being prepared in the Inuktitut language, and a CD-ROM with additional background information is being prepared.

GEOSCAPE Nunavut

As part of the national GEOSCAPE project, the C-NGO has undertaken work on an initiative to relate the geology of the territory to its citizens. In contrast to other GEOSCAPE posters that focus on a single municipal area, ours will illustrate features from across Nunavut. A first draft of the poster is complete, and stakeholder consultation is ongoing. We anticipate completion of the poster prior to the end of 2002.

Geotourism in Nunavut (DIAND)

Jurate Gertzbein began working with local tour operators and outfitters to identify opportunities for the latter to incorporate geological knowledge and features into tourist activities. This year's efforts concentrated on Wager Bay and Marble Island along the western shore of Hudson Bay. Summary reports have been compiled and delivered to outfitters and operators, and opportunities for 2002 are now being examined.

Compilation of Bedrock Geoscience Knowledge

Work has begun on an NADM-compliant bedrock geoscience database that will be the foundation for a new 1:1 000 000-scale digital compilation of existing knowledge. The database is being populated using existing paper-based datasets as well as recently acquired digital information. The first product will be a new synthesis of the geology of Baffin Island, in traditional paper as well as digital formats. We are working with the national CGKN initiative to ensure that this fundamental dataset will be web-enabled as expeditiously as possible.

Digital field data collection using Palm handheld computers

In response to our need to manage data collection in large field crews, we have implemented an NADM-compliant data capture system that operates on Palm handheld computers. The system has a very short learning curve, is robust on the outcrop, and can easily customized to suit a variety of bedrock and surficial mapping applications. Data are downloaded into a database in the field camp on a daily basis, and can be visualized immediately using a variety of GIS packages. A brief overview of the system was reported in the GSC's 2001 Current Research. Numerous improvements to the system have been made following the second season of widespread use in the field; electronic copies of the data collection forms are available via the C-NGO web site:

www.nunanet.com/~cngo

GIS Internship Program

There is an acute need for skilled GIS technicians to help numerous Nunavut organizations satisfy resource management obligations under the Nunavut Land Claims Agreement. In response, the C-NGO is taking the lead on implementation of a collaborative training strategy that targets graduates of the Environmental Technology Program at Arctic College in Iqaluit. We have developed a flexible program of internships for Nunavut youth that will help to build GIS skills and consequently develop local capacity in this important field. We are working with several Nunavut-based organizations to build their GIS capacity.

Targeted Geoscience Initiative / L'Initiative géoscientifique ciblée
Geological Survey of Canada

Overview

The Targeted Geoscience Initiative (TGI) delivers on the government's commitment in the 2000 federal budget to provide new funding of $5 million/year for three years in order to stimulate new investment in mineral exploration in Canada.

TGI has been implemented by the GSC in partnership with provincial or territorial geological surveys, industry and academia. The new funding is augmented by $8 million from GSC's appropriation and $19 million from partners over the three years, resulting in a total program expenditure of $42 million.

The overall strategic direction of TGI is provided by a Steering Committee that also recommends projects for approval. The Steering Committee comprises three representatives of the mineral industry, three representatives from the Committee of Provincial Geologists, and three representatives from the Geological Survey of Canada.

TGI has funded 29 projects, selected following assessment against a set of common criteria. TGI has also supported the On-line Data Catalogue project of the Canadian Geoscience Knowledge Network (CGKN)

Program Elements

The TGI comprises two main kinds of projects:

Integrated geoscience mapping

The mineral industry has identified the geoscience maps produced by government geological surveys as one of the key competitive advantages in attracting mineral exploration investment to Canada. The largest component of the TGI will comprise integrated geological, geophysical and geochemical mapping and, where appropriate, related thematic studies. This mapping will be targeted on under-ex-

Vue d'ensemble

L'Initiative géoscientifique ciblée (ICG) concrétise l'engagement pris par le gouvernement dans le budget fédéral 2000 de consacrer 5 millions de dollars par année, pendant trois ans, à l'apport d'investissements dans l'exploration minière au Canada.

L'ICG a été mise en œuvre par la CGC en partenariat avec les commissions géologiques provinciales ou territoriales, l'industrie et les universités. Le nouveau financement est augmenté de 8 millions de dollars provenant du crédit de la CGC et de 19 millions de dollars fournis par les partenaires sur la période de trois ans, ce qui porte les dépenses totales du programme à 42 millions de dollars.

L'orientation stratégique générale de l'ICG est fournie par un comité directeur, dont le mandat consiste également à recommander des projets. Le Comité directeur se compose de trois représentants de l'industrie des minéraux, de trois représentants et de trois représentants de la Commission géologique du Canada.

L'ICG a financé 29 projets retenus par suite d'une évaluation en fonction d'un ensemble de critères communs. L'ICG a également souscrit au projet de Catalogue de données en ligne du Réseau canadien de connaissances en sciences de la Terre (RCCST).

Éléments du programme

L'ICG se compose essentiellement de deux types d'activités:

Cartographie scientifique intégrée

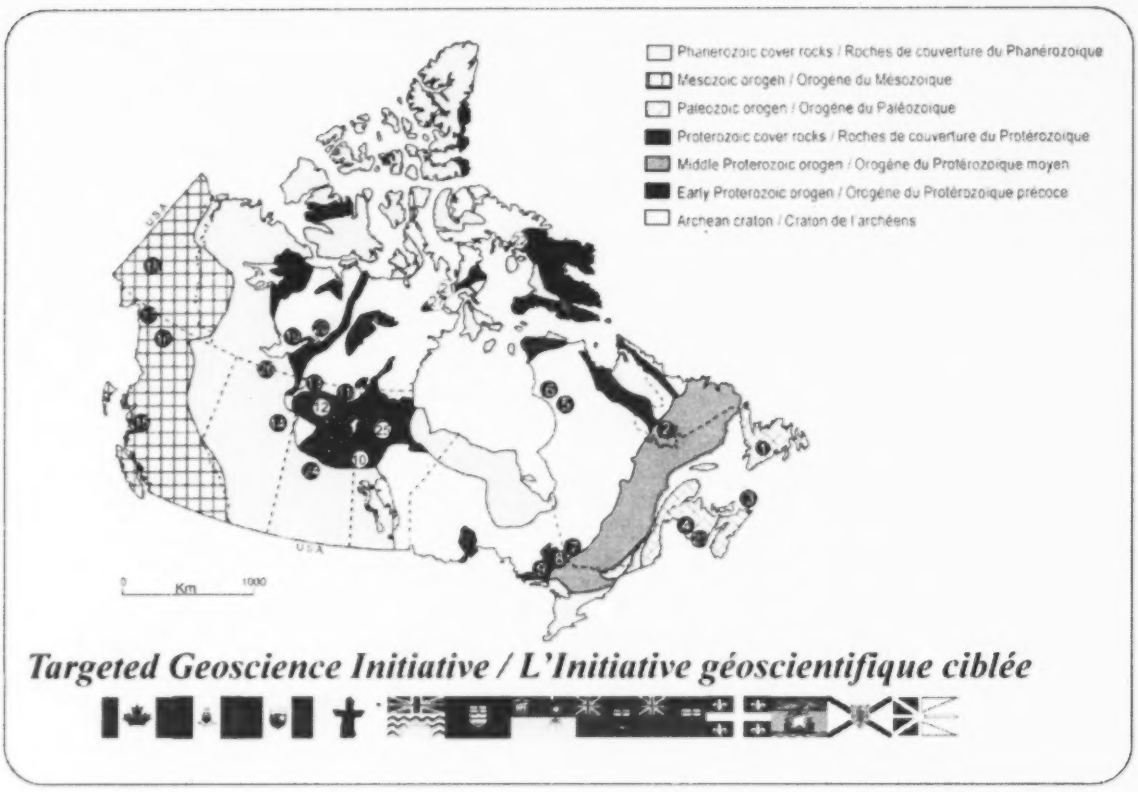
Aux yeux de l'industrie des minéraux, les cartes géoscientifiques produites par les commissions géologiques gouvernementales sont un des principaux facteurs de concurrence qui incitent l'industrie à investir dans l'exploration minière au Canada. L'ICG sera surtout constituée de travaux de cartographie

TGI Project List — *Les Projets ICG*

Project Location Map Index number Carte d'emplacements des projets ICG	GSC Project Leader/ Chef de projet CGC	Project Title/Titre du projet
1	C.R. Van Staal	Geology of the Iapetus suture zone, Red Indian Line, Newfoundland / Géologie de la zone de suture de l'océan Iapetus, Faille de Red Indian, Terre-Neuve
2	L. Nadeau	Tectonic framework and evolution of the Eastern Grenville Province / Cadre tectonique et évolution de la province de Grenville Orientale
3	P.S. Giles	Geological mapping for mineral development in South-Central Cape Breton Island / Cartographie géologique pour la mise en valeur des minéraux dans le Centre Sud-de-l'île du Cap-Breton
4	P.W.B. Friske	NGR Stream sediment & water surveys in New Brunswick and related follow-Up & orientation studies / Programme d'exploration géochimique préliminaire levés géochimiques des sédiments fluviatiles et de l'eau au Nouveau Brunswick
5	R. Dumont	Airborne geophysical survey: Lac Vernon/Lac Anuk/Grand Nord / Levés géophysiques aériens: Lac Vernon/Lac Anuk/Grand Nord
6	M. Parent	Glacial dynamics and diamond exploration in Northern Quebec / Dynamique glaciaire et prospection du diamant dans le Nord du Québec
7	B. Dubé	Metallogeny of the Doyon-Bousquet-Laronde District, Abitibi, Quebec / Métallogénie du camp minier de Doyon-Bousquet-Laronde, Abitibi, Québec
8	M.B. McClenghan	Enhancement of kimberlite exploration methods, Timiskaming region, Ontario / Amélioration des méthodes d'exploration des kimberlites, région de Timiskaming, Ontario
9	D.E. Ames	Role of structure and host rocks in the evolution of Sudbury ores / Rôle de la structure et des roches hôtes dans l'évolution des minerals de Sudbury
10	A.G. Galley	Regional hydrothermal systems as an exploration guide: Flin Flon mining camp / Systèmes hydrothermaux régionaux utilisés comme guide d'exploration : camp minier de Flin Flon
11	R.B.K. Shives	Phelps Lake area integrated mapping project, Saskatchewan / Projet de cartographie intégrée dans la région du Lac Phelps, Saskatchewan
12	C.W. Jefferson	EXTECH IV - Athabasca uranium multidisciplinary study / EXTECH IV - Étude multidisciplinaire sur l'uranium de l'athabasca
13	R.B.K. Shives	Uranium City area integrated mapping project, Saskatchewan / Projet de cartographie intégrée dans la région d'Uranium City, Saskatchewan
14	A.N. Rencz	National Geochemical Reconnaissance (NGR) surveys and related orientation studies in Northeastern Alberta / Programme d'exploration géochimique préliminaire levés et études d'orientation connexes dans le Nord-Est de l'Alberta
15	L.C. Struik	Volcanic Massive Sulfide (VMS) potential of East Bella Coola map area, British Columbia / Potentiel en gisements de sulfures massifs associés à des roches volcaniques dans l'est de la région cartographique de Bella Coola, Colombie-Britannique

TGI Project List — *Les Projets ICG*

Project Location Map Index number Carte d'emplacements des projets ICG	GSC Project Leader/ Chef de projet CGC	Project Title/Titre du projet
16	P.W.B. Friske	National Geochemical Reconnaissance (NGR) surveys in B.C. to target and attract mineral exploration / Programme d'exploration géochimique préliminaire levés dans la Cordillère en Colombie-Britannique, pour susciter et cibler des travaux d'exploration minérale
17	C. Lowe	Atlin, B.C. - Integrated geoscience mapping / Atlin, Colombie?Britannique - cartographie géoscientifique intégrée
18	S. Gordey	Integrated geoscience mapping for Yukon: NATMAP enhancement / Cartographie géoscientifique intégrée au Yukon: augmentation de CARTNAT
19	C.D. Anglin	EXTECH III - Yellowknife enhancement project/ EXTECH III - Projet d'augmentation de Yellowknife
20	W.J. Davis	Integrated geoscience mapping and lithospheric-scale geophysical investigations, SE Slave Province / Cartographie géoscientifique intégrée et études géophysiques à l'échelle de la lithosphère, dans le sud-est de la province des Esclaves
21	T. Skulski	Integrated geoscience mapping and geophysics of the Committee Bay greenstone belt, central Nunavut / Cartographie géoscientifique intégrée et géophysique de la ceinture de roches vertes de la Baie Committee, centre du Nunavut
22	O. Van Breemen	Geochronology, synthesis and database of the Quebec/Baffin segment of the Trans-Hudson Orogen / Géochronologie, synthèse et base de données du segment Québec-Baffin de l'orogène Trans-Hudsonien
23	G. Chi	Metallogeny of intrusion-related gold systems in southwestern New Brunswick / Métallogénie des systèmes aurifères associés à des intrusions dans le sud-ouest du Nouveau-Brunswick
24	J.P. Zonneveld	Diamondiferous kimberlites of central Saskatchewan / Kimberlites diamantifères dans le centre de la Saskatchewan
25	D. Corrigan	Tectonostratigraphic setting and mineral potential of volcanosedimentary belts along the Granville Lake-South Indian Lake transect, Northern Manitoba / Contexte tectonostratigraphique et potentiel minéral des zones volcanosédimentaires le long du transect Granville Lake-South Indian Lake, dans le Nord du Manitoba
26	P. Hannigan	Potential for carbonate-hosted PB-ZN (MVT) deposits in northern Alberta and southern NWT / Potentiel en gisements de Pb-Zn en roches carbonatées (du type Mississippi Valley), dans le Nord de l'Alberta et le Sud des Territoires du Nord-Ouest
27	I. McMartin	Committee Bay drift prospecting survey, central Nunavut / Prospection glaciosédimentaire de la Baie Committee, centre du Nunavut


Phanerozoic cover rocks / Roches de couverture du Phanérozoique
Mesozoic orogen / Orogène du Mésozoique
Paleozoic orogen / Orogène du Paléozoique
Proterozoic cover rocks / Roches de couverture du Protérozoique
Middle Proterozoic orogen / Orogène du Protérozoique moyen
Early Proterozoic orogen / Orogène du Protérozoique précoce
Archean craton / Craton de l'archéens
U.S.A.
0 Km 1000
Targeted Geoscience Initiative / L'Initiative géoscientifique ciblée

Regional/National TGI Projects
Projets ICG regionale/nationale

Project Locations/ Emplacements de projet	GSC Project Leader/ Chef de projet CGC	Project Title/Titre du projet
Ontario, Quebec/ Québec, Manitoba, Northwest Territories/ Territories du Nord-Ouest, Nunavut	M. Pilkington	Locating new Platinum Group Element (PGE) exploration targets in Canada, based on a mantle plume model / Localisation de nouvelles cibles d'exploration pour la recherche des éléments du groupe platine au Canada, à l'aide d'un modèle fondé sur les panaches mantelliques
Ontario, Quebec/ Québec, Newfoundland & Labrador/Terre-Neuve et Labrador, Nunavut	L.J. Hulbert	Platinum Group Elements (PGE): Digital database and GIS / Des éléments du groupe platine: Base de données numérique et SIG
National/nationale	J. Rupert	Canadian Geoscience Knowledge Network: (CGKN) ? Data catalogue project / Réseau Canadien de connaissances géoscientifiques projet de catalogue de données

plored areas of high mineral potential as well as in more mature districts where sustained production is threatened by declining ore reserves.

Digital data capture, analysis and dissemination

If Canada is to remain competitive in the increasingly global mineral exploration market, there must be virtually instantaneous access to our exploration-related geoscience information from anywhere in the world. Moreover, diverse data must be provided in a way that it is readily integrated and analyzed. To help get Canada's geological survey data "on line", the TGI is making strategic investments to enhance the Canadian Geoscience Knowledge Network (CGKN), a cooperative venture being championed by the National Geological Surveys Committee.

Project Selection Criteria

Projects are selected on the basis of proposals developed in consultation with the Committee of Provincial Geologists and assessed using a formal decision support system to evaluate the following six criteria:

- ✔ Consistency with the role of the Geological Survey of Canada as defined in the *Intergovernmental Geoscience Accord* in 1996
- ✔ Extent to which the proposal addresses national geoscience priorities, as defined by the National Geological Surveys Committee in March 1999, or regional geoscience priorities defined by the bilateral process in each jurisdiction
- ✔ Likelihood that the project will have a demonstrable impact on mineral exploration within the TGI timeframe
- ✔ Likelihood that the project will have positive social impacts (*e.g.*, in communities)
- ✔ Scientific and technical merit
- ✔ Extent of provincial/territorial collaboration in project delivery and funding

Project Information

A listing of TGI projects and their locations are provided in the accompanying table and

géologique, géophysique et géochimique intégrée, complétés s'il y a lieu par des études thématiques. Ces travaux de cartographie seront concentrés dans des zones sous-explorées mais dotées de grandes potentialités minérales, et où l'épuisement des réserves de minerai menace la production.

Acquisition, analyse et diffusion de données numériques

S'il veut demeurer compétitif sur un marché de l'exploration minérale qui se mondialise de plus en plus, le Canada doit tout mettre en œuvre pour que son information géoscientifique pertinente soit accessible presque instantanément de n'importe où dans le monde. En outre, les données provenant de diverses sources doivent être fournies de telle manière qu'elles puissent être facilement intégrées et analysées. Pour aider les commissions géologiques du Canada à mettre leurs données en ligne, on fera des investissements stratégiques dans le développement du Réseau canadien de connaissances géoscientifiques qui est un projet collectif réalisé sous l'égide du Comité national des commissions géologiques.

Critères de sélection des projets

Les propositions de projet sont sélectionnées en consultation avec le Comité des géologues provinciaux et elles sont évaluées à l'aide d'un système de soutien décisionnel établi, en fonction des six critères suivants:

- ✔ Conformité avec le rôle de la Commission géologique du Canada défini dans *l'Accord géoscientifique intergouvernemental* de 1996
- ✔ Rapport avec les priorités géoscientifiques nationales définies par le Comité national des commissions géologiques en mars 1999, ou avec les priorités géoscientifiques régionales définies dans chaque province et territoire au moyen du processus bilatéral
- ✔ Probabilité d'un impact démontrable sur l'exploration minérale pendant la période d'application de l'ICG
- ✔ Probabilité d'un impact social positif (par exemple dans les collectivités)
- ✔ Valeur scientifique et technique

map. General information and individual "*fact sheets*" for each of the TGI projects listed can be found on the GSC's WEB Site:

www.NRCan-RNCan.gc.ca:80/gsc/tgi_e.html

Étendue de la collaboration des provinces ou des territoires à la réalisation et au financement du projet

L'Information de projet

Une liste des projets ICG et leur emplacement geographique sont présentés dans la table et la carte suivantes. Les informations générales et les fiches signalétiques pour chacun des projets IGC énuméré sur le site de CGC:

www.NRCan-RNCan.gc.ca:80/gsc/tgi_f.html

Survey of Hard Rock Drill Core Programs 2000-2001

SURVEY OF HARD ROCK DRILL CORE PROGRAMS IN CANADA

Fiscal Year 2000 - 2001

PROVINCE	B.C. **	ALBERTA	SASK. ***	MANITOBA	ONTARIO	QUEBEC ****	N.B.	N.S.	NEWFOUNDLAND & LABRADOR	P.E.I. *****	YUKON	NWT	NUNAVUT *****
No. of Facilities	n/a	1	2	5	5	n/a	3	3	6	1	1	1	0
Use of Facilitates *Person Days (pd) Visits (v)*	n/a	59	24	35	150	n/a	150-200 *(pd)*	175	175	n/a	40 *(v)*	3	0
Staff Person Days Worked	n/a	200	116	15	200	n/a	572	450	640	n/a	100	80	3
Capital Cost	n/a	$32,000	$19,400	n/a	n/a	n/a	$48,500	$0	$80,000	n/a	$30,000	$0	$5,000
Operating Cost	n/a	45	19.9	5	19.8	n/a	4.5	15	30.9	n/a	7	9	0
Core Collected and/or Delivery	n/a	6 865	1 891.09	7 500	14 468	n/a	4 904	4 209	22 289	2 500	297.5 m	209	200
Core Reduction	n/a	NIL	NIL	NIL	NIL	*Facility closed summer 2000*	NIL	NIL	NIL	n/a	2 500	NIL	0
Total Core in Storage (metres)	n/a	46 665	88 227.04	242 000	1 672 210	n/a	655 504	665 000	1 000 055	3 670	124 400	30 347	5000
Total Exploration Drilling	140 000	9 000	102 244	89 829	250 000	300 000	17 000	8 000	74 000	n/a	12 694	30 000	102000

* *Over last year*

** *B.C. has no facilities for hard rock core.*

*** *Saskatchewan: figures from Petroleum and Natural Gas Collection Subsurface Laboratory, Region which stores stratigraphic Athabasca Group core, are not included.*

**** *Quebec Facilities closed in 2000.*

***** *PEI has no core storage program.*

****** *Nunavut has no core storage program.*

The Canadian Geoscience Knowledge Network - A Collaborative Effort for Unified Access to Geoscience Data

The Canadian Geoscience Knowledge Network
A Collaborative Effort for Unified Access to Geoscience Data

By E.C. Grunsky[1] and J.H. Broome[2]
[1]Alberta Geological Survey
[2]Earth Sciences Sector Information Office, Natural Resources Canada

Introduction

The rapid evolution and revolution of information technology and subsequent management of digital information have opened new avenues for capturing, managing and disseminating geoscience information. Geological surveys now routinely capture field data using digital technology, laboratory results are recorded automatically in digital form and the conventional geological map which was formerly presented in paper form is now a digital representation within databases, geographical information systems and satellite imaging systems. This fundamental change in how geoscience data are managed has impacted all geological surveys. As Canadian geological surveys adapt to the management of digital data, it is reasonable to expect that they can benefit by sharing their experiences and knowledge. Making geoscience information available over the Internet is an important way Canada can maintain its global competitiveness in attracting resource exploration. Also, by adopting common standards and data management tools, data can be more accessible to all.

The Canadian Geoscience Knowledge Network (CGKN) is designed to create a seamless network of information from government geoscience agencies in Canada. In 1998, a workshop, organized by the National Geological Surveys Committee (NGSC), brought together representatives of the 13 government surveys and they explored and endorsed the CGKN concept as a way to provide access to geoscience information holdings of Canada's federal, provincial and territorial geological surveys. Following the 1998 workshop, a CGKN Steering Committee was formed to develop a national strategy for geoscience data management. The Steering Committee evaluated how the geoscience agencies could participate and identified a number of priority areas in which cooperative development could begin.

During 2000, the CGKN organized a survey of the geoscience data management activities of Canadian geological surveys. This survey, which was funded by GeoConnections and carried out by a consulting firm, reported that there is a wide range of geoscience data models and data management methods in place in Can-

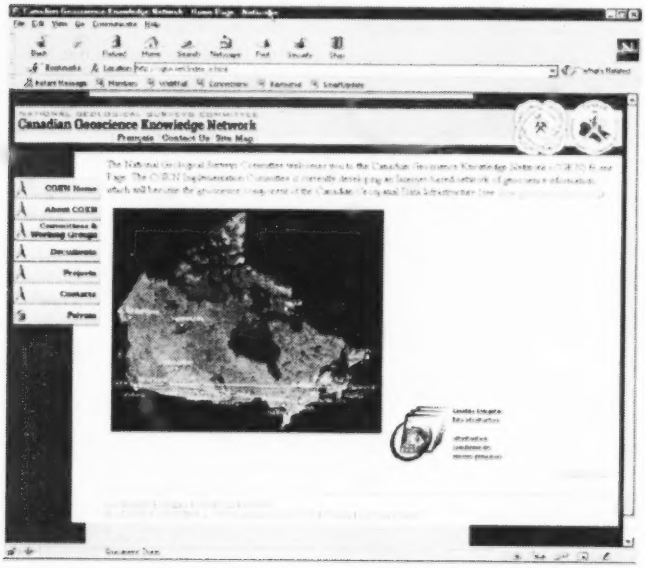


Figure 1: The CGKN Home Page is the on-line portal to CGKN services and activities. (http://www.cgkn.net)

ada. A second workshop was held in June 2000 to review the survey report, investigate standards, and develop implementation plans. At the workshop, priority areas for building the CGKN were identified and working groups were established to develop and implement specific components of the network.

From these workshops, and regular telephone conference calls, the working groups together with the National Geological Surveys Committee (NGSC) member agencies are implementing the CGKN. Information about CGKN and its initiatives can be found at the CGKN website (http://www.cgkn.net).

CGKN Business Plan

The CGKN has been identified by the NGSC as a key strategy of the Intergovernmental Geoscience Accord for the management and dissemination of geoscience knowledge. Following the endorsement of the CGKN from the NGSC, the Steering Committee was instructed to develop a business plan outlining objectives, benefits, stakeholders, and project priorities. Details of the CGKN initiative can be obtained from the CGKN website identified in Figure 1.

Objectives:

- ✔ Provide a single Internet portal that will facilitate discovery and evaluation of NGSC agency data and link the client to the data provider;
- ✔ Provide the infrastructure, tools, and standards required for capturing, managing and disseminating consistent and interoperable NGSC geoscience knowledge via the Internet;
- ✔ Implement a "loosely-coupled" architecture that allows participating agencies to exchange and provide access to consistent and interoperable geoscience information without the need for extensive changes to their existing systems and infrastructure.
- ✔ Provide national coverage at regional scales for key data types;
- ✔ Make NGSC data holdings accessible through CGKN and CGDI services;
- ✔ Enable each NGSC member agency to deliver geoscience information independently or through common services in conformity with CGKN national standards.

Benefits

- ✔ Cost savings through cooperative shared development of standards, tools, and systems for management and dissemination of geoscience data;
- ✔ Improved service by providing a single geoscience portal through which clients will be able to discover, view, evaluate, and obtain geoscience data from NGSC agencies;
- ✔ As national standards and tools are developed through the CGKN projects, the outcome will be improved internal management and analysis of geoscience data. As well, clients will have improved access to more, and better quality geoscience data;
- ✔ The resulting network of geoscience information will put the provinces and the nation in a globally competitive and leadership role;
- ✔ The CGKN is designed to create the geoscience component of the GeoConnections initiative (**www.geoconnections.org**). This relationship to GeoConnections, which is developing the Canadian Geospatial Data Infrastructure, will allow Canadian geoscience organizations to participate and disseminate information beyond their traditional client base.

Stakeholders

- ✔ Data custodians whose main role is to capture, maintain and disseminate geoscience information;
- ✔ Data providers who are the contact points for receiving requests, and issuing geoscience products;
- ✔ Geological survey staff who play a key role in defining data capture and data management requirements;
- ✔ Geological survey managers who provide high level guidance and direction to ensure that activities meet the CGKN objectives.

Clients

- ✔ Traditional clients who represent the mining and exploration industry, consultants and service organizations;
- ✔ Survey management that uses existing geoscience knowledge for strategic planning;
- ✔ Scientific users who acquire unprocessed data and carry out additional analysis and interpretation;
- ✔ The general public who require knowledge about the geology of Canada in terms that are informative, educational and easy-to-understand;
- ✔ Other government agencies that require geoscience information for environmental, health, silviculture, agriculture, water and engineering programs.

Current CGKN Activities

CGKN On-line Geoscience Data Catalogue Project

This ongoing project will create comprehensive catalogues containing consistent metadata describing all government geoscience data and will implement a CGKN Internet search engine. This project is funded by the Earth Science Sector's Targeted Geoscience Initiative (TGI). Since the project was initiated in the summer 2000, the following progress has been made by the federal/provincial Implementation Working Group.

- ✔ Based on a survey of each agency's present level of metadata readiness, TGI funding has been allocated to all NGSC agencies to support creation of standard CGKN geoscience metadata catalogues and catalogue creation is underway.
- ✔ Software products for the CGKN online search tool are installed.
- ✔ CGKN Discovery Portal configuration and customization is underway.

To ensure timely completion of the project by January 2002, the project working group requests that all NGSC member agencies review their plans to utilize their allocated TGI funding for creation of their catalogue.

GeoConnections-Funded CGKN Projects

The federal-provincial CGKN Data Integration Working Group is coordinating the solution of technical issues related to CGKN Implementation. Subgroups involving both federal and provincial participants have been created to develop the CGKN standards and tools required by each discipline. In early 2001, the CGKN applied to GeoConnections for funding to enable the development support of the CGKN. CGKN working groups developed a number of proposals for GeoConnections funding based on de-

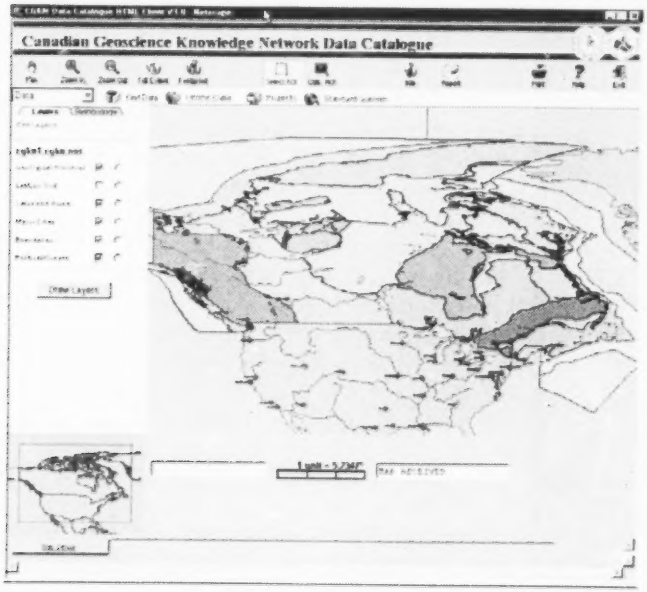


Figure 2: This is a prototype of the interface for the CGKN on-line search engine that will go online early in 2002.

tailed studies of agency requirements and experience with small pilot studies. These proposals were approved in July 2001. The CGKN will receive $290 000 from GeoConnections in fiscal year 2001/2002 which will be used to support the following CGKN projects and activities:

A) National Bedrock Geology Database Development;

B) National Surficial Geology Database Development;

C) Development of Toolkit for National Geochemical Database;

D) Development of XML-based Data Transfer standards for mineral occurrence and geochemical data;

E) Coordination and Web Site Improvements.

Project Details

National Bedrock Geology Database Development

A geological map database, based on the North American Data Model (NADM), is being developed. The database will contain maps for BC, Yukon, and parts of Nunavut, Labrador, and Newfoundland. This process will establish the protocols and standards which will be the foundation for a CGKN bedrock geology layer. In May, a two-day federal-provincial workshop was held in St. John's to establish the design and schedule Phase 1 of the project. Leaders of the geochemistry and surficial geology groups also attended. A new version of the "Geomatter" geological map data editor has been recently released.

National Surficial Geology Database Development

A preliminary logical data model for surficial geology data has been completed. Standards for language and structure are also nearing completion. The Ontario Geological Survey, Manitoba Energy and Mines, and Geological Survey of Canada are active participants. The bedrock and surficial geology data models and tools (Geomatter, *etc.*) are being developed in parallel. Development of a web site to provide access to preliminary data will commence in September.

Development of Toolkit for National Geochemical Database

At least six provinces and the GSC are participating in the "Geochemistry on-line" Project and meet regularly. Participants have agreed on Version 1.1.1 of the CGKN geochemistry data model. The project team is continuing development of a set of tools "GoldTools", based in part on XML, for the exchange of geochemical data between agencies. The future development of "GeoChemistry Online" will involve the mineral exploration industry, and BHP-

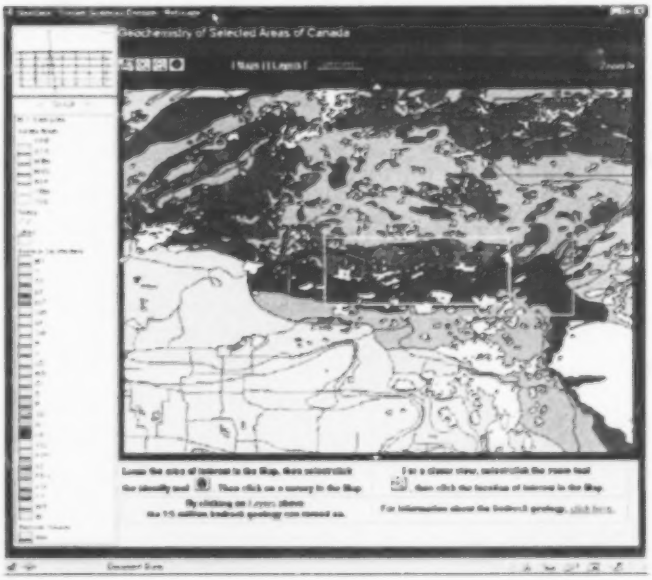


Figure 3: The "Geochemistry On-line" web site, currently being developed, will support web searches for Canadian geochemistry data.

Billiton, Inco, and Falconbridge have already expressed interest.

Development of XML-based Data Transfer standards for mineral occurrence and geochemical data

XML is becoming a standard protocol for transfer of data on the Internet. GML is an XML *schema*, or specification, for transfer of geographic information. The CGKN/ GeoConnections have funded a project to develop a CGKN XML *schema* for geoscience data. This work will be done in partnership with Galdos Systems (Vancouver), an international leader in XML and GML development. The initial *schema* will be developed for mineral deposit data but may be extended to include geochemical and geophysical data. The project team is collaborating with the Australian CSIRO-led team developing XML geoscience schema for the mining community.

Other activities

The CGKN Geophysics Working Group is partnering with Geosoft and DM Solutions Group on a GeoInnovations proposal to develop systems for online visualization and delivery of geophysical, mineral deposits and geochemistry data types.

The Future

As the CGKN develops we can look forward to increased online availability of all types of geoscience information making Canada a leader in the provision of information and the management of information. By providing Canadian geological surveys with tools to manage and deliver their geoscience information, the CGKN initiative will improve their operational efficiency and enable their information to be globally accessible. This shared approach of inter-agency co-operation and the development of common standards and data models will ensure Canada's prominence in the global market place.

2001 Committee of Provincial Geologists

British Columbia:
Ron Smyth, Director & Chief Geologist
Geological Survey Branch
Ministry of Energy and Mines
PO Box 9320 Stn Prov Gov't
5th Floor - 1810 Blanshard Street
VICTORIA, BC, V8V 9N3
Tel: 250-952-0374 Fax: 250-952-0371
E-mail: ron.smyth@gems4.gov.bc.ca
http://www.em.gov.bc.ca/geology

Alberta:
Rick Richardson, Provincial Geologist & Mgr.
Alberta Geological Survey
Alberta Energy and Utilities Board
4th Floor, 4999 - 98 Avenue
EDMONTON, AB, T6B 2X3
Tel: 780-427-1980 Fax: 780-422-1459
E-mail: rick.richardson@gov.ab.ca
http://www.ags.gov.ab.ca

Saskatchewan:
Gary Delaney, Director & Chief Geologist
Northern Geological Survey Branch
Saskatchewan Energy and Mines
2101 Scarth Street, REGINA, SK, S4P 3V7
Tel: 306-787-1160 Fax: 306-787-1284
E-mail: gdelaney@sem.gov.sk.ca
http://www.gov.sk.ca/enermine

Manitoba:
Ric Syme, Director,
Manitoba Geological Survey
Manitoba Industry, Trade and Mines
360-1395 Ellice Ave.
WINNIPEG, MB, R3G 3P2
Tel: 204-945-6556 Fax: 204-945-1406
E-mail: rsyme@gov.mb.ca
http://www.gov.mb.ca/itm/mrd/index.html

Ontario:
Andy Fyon, Senior Manager
Precambrian Geoscience Section
Ontario Geological Survey
Ministry of Northern Development and Mines
B7, 933 Ramsey Lake Road
SUDBURY, ON, P3E 6B5
Tel: 705-670-5924 Fax: 705-670-5905
E-mail: andy.fyon@ndm.gov.on.ca
http://www.mndm.gov.on.ca/MNDM/MINES/mmdhpge.htm

Québec:
Alain Simard
Géologique Québec
Ministère des Ressources naturelles
5700, 4ieme Avenue Ouest, bureau A-208
CHARLESBOURG, PQ, G1H 6R1
Tel: 418-627-6274 Fax: 418-643-2816
E-mail: alain.simard@mrn.gouv.qc.ca
http://www-geologie-quebec.gouv.qc.ca

New Brunswick:
Rao Irrinki, Director
Geological Survey Branch
N.B. Dept of Natural Resources and Energy
P.O. Box 6000
FREDERICTON, NB, E3B 5H1
Tel: 506-453-8825 Fax: 506-453-3671
E-mail: rao.irrinki@gnb.ca
http://www.gnb.ca/dnre/0078/minerals.htm

Nova Scotia:
Mike Cherry, Director
Minerals & Energy Resources Division
Nova Scotia Department of Natural Resources
P.O. Box 698, 1701 Hollis Street
HALIFAX, NS, B3J 2T9
Tel: 902-424-8135 Fax: 902-424-7735
E-mail: cherryme@gov.ns.ca
http://www.gov.ns.ca/natr/meb

Newfoundland & Labrador:
Frank Blackwood, Director
Geological Survey
Department of Mines and Energy
P.O. Box 8700
ST. JOHN'S, NF, A1B 4J6
Tel: 709-729-6541 Fax: 709-729-3493
E-mail: rfb@zeppo.geosurv.gov.nf.ca
http://www.geosurv.gov.nf.ca

Yukon:
Grant Abbott, Chief Geologist/Regional Mgr.
Exploration and Geological Services Division
Northern Affairs Program, Yukon Region
345 - 300 Main Street
WHITEHORSE, YK, Y1A 2B5
Tel: 867-667-3200 Fax: 867-667-3198
E-mail: abbottg@inac.gc.ca
http://www.geology.gov.yk.ca/

Northwest Territories:
Carolyn Relf, Chief Geologist
NWT Geology Division
Northern Affairs Program
Dept of Indian Affairs & Northern Development
P.O. Box 1500,
YELLOWKNIFE, NT, X1A 2R3
Tel: 867-669-2640 Fax: 867-669-2725
E-mail: relfc@inac.gc.ca
http://www.inac.gc.ca/regions/nt/geology.html

Nunavut:
David J. Scott, Chief Geologist
Canada - Nunavut Geoscience Office
P.O. Box 2319,
IQALUIT, NU, X0A 0H0
Tel: 867-979-3539 Fax: 867-979-0708
E-mail: djscott@nrcan.gc.ca
http://www.nunanet.com/~cngo